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VOLUME 2

MACKENZIE VALLEY PIPELINE INQUIRY

RESPONSES OF CANADIAN ARCTIC GAS PIPELINE LIMITED
TO COMMISSION COUNSEL SUBMISSIONS

CHAPTER 3

... THE PROJECT

DECEMBER 6, 1976

CANADIAN ARCTIC
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December 6, 1976

Mr. Ian Wadell
Special Counsel
Mackenzie Valley Pipeline Inquiry
c/o Law Courts
800 West Georgia Street
VANCOUVER, British Columbia

Dear Sirs:

Re: Arctic Gas Responses to Recommendations for
Terms and Conditions

Enclosed are the responses of Arctic Gas to the recommendations for terms and conditions that were advanced, by way of argument, by Commission Counsel, Foothills and participants in Yellowknife during the week of November 15th, 1976.

As you appreciate, limited time has been available for preparation of these responses. Arctic Gas has therefore responded to many recommendations for terms and conditions in the same level of detail in which the various recommendations were made. In some cases, revisions have been suggested or it has been pointed out that the level of detail has not proved necessary at this stage.

We wish to stress that our detailed response has been necessitated solely by the extremely detailed nature of the recommendations for terms and conditions and the Arctic Gas responses cannot be taken as giving support to the overall approach taken by Commission Counsel and certain of the participants, particularly CARC.

We fully agree with and support the position put forth by Mr. Carson Templeton in his argument:

"In my opinion, the terms and conditions should be written as

Macleod Dixon

December 7th, 1976

Page 2

a performance specification - not as a construction specification or project handbook. None of us can write a complete handbook for this project nor can we, or should we attempt to, write a detailed construction specification at this stage. We should, in my opinion, specify as clearly and precisely as we can the results or performance we expect the project to achieve, not how to achieve those results or that performance . . . When and if the government adopts terms and conditions, the terms and conditions will change from recommendations to regulations and may well prevent productive innovation by the regulatory agency and/or the permittee later."

Arctic Gas shares with Mr. Templeton the opinion that the "agency" employees and consultants and Arctic Gas are best able to prepare the "how to achieve" and "demonstrations of achievement" details which will be required later.

We would also like to draw attention to the practice, common throughout the Commission Counsel Submission, of introducing apparently arbitrary quantitative standards to be applied during various phases of pipeline development. In many instances, there is no justification for the standards, either in the body of the report, in the testimony before this hearing, or in the scientific literature. In others, notably the proposed use of the Standard Project Flood, recognized techniques seem to have been misapplied. Specific criticisms of those recommendations which include quantitative standards form part of our responses to the Commission Counsel Submissions. Where we have found the recommended standard to be arbitrary or ill-founded, we have either:

- a. suggested that there is insufficient information available to arrive at a precise quantitative standard and that each case must therefore be decided on its own merits; or
- b. in those areas where there is a sufficient body of information, suggested a more realistic standard based on our own understandings of the subject.

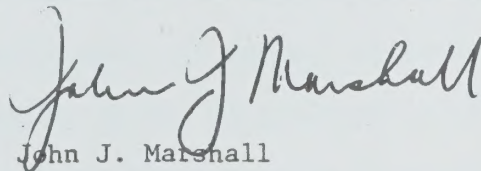
We would concede that in some subject areas, where there is presently insufficient information, it would be desirable from the point of view of both Applicant and Government to have quantitative standards. In such cases, we would look favourably on a recommendation that demonstrated: first, that an area of concern had been identified; second, that there was a reasonable expectation that quantitative standards could be developed; third, that as yet there were insufficient data available to define such standards; and fourth, that studies should be undertaken by government agencies and/or Arctic Gas to arrive at suitable quantitative criteria.

This point was made in oral argument.

It might be argued that even poorly documented quantitative standards are better than none at all, better than the site-specific, case-by-case approach which Arctic Gas generally prefers. (For example, Commission Counsel recommends that stockpile sites be located at least 300 feet from any river bank or shore, that wharf sites be located at least $\frac{1}{4}$ mile from any stream or river mouth, that all fuel and chemical storage areas and major camps shall be located at least 1,000 feet from any river bank or shore, and that no blasting be permitted within one mile of sites where fishing is actively in progress. Arctic Gas has responded that such distances are arbitrary and meaningless and that each site must be assessed on its own merits, before exact locations are determined). We would argue that there is great danger in establishing ill-considered standards, giving an aura of authenticity to quantities which have no basis in fact and fostering the notion that because some facility has been constructed in compliance, environmental and social concerns are necessarily protected.

You will appreciate that these responses have been prepared in a rather limited amount of time. If you feel that you would be assisted by amplification, Canadian Arctic Gas is, of course, ready to co-operate in any way.

Yours very truly,


John J. Marshall

JJM/jr

cc. Mr. Ian Scott, Q.C.

cc. Mr. R. J. Gibbs, Q.C.

cc. Participants

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E R R A T A

RESPONSE BY ARCTIC GAS TO

COMMISSION COUNSEL SUBMISSIONS

Pipeline and Facilities

Vegetation Clearing

1. Recommendation 26. The response (instead of acceptable) should read:

RESPONSE:

It would be preferable to burn timber at the time of construction rather than two years later.

ALTERNATIVE RECOMMENDATION:

26. At the time of right-of-way clearing, it should be determined whether or not merchantable timber should be preserved. If so, it will be cut and stacked for use by others, if not, it will be burned.

Pipeline and Facilities

Snow Roads

2. Recommendation 7. The response should read as follows:

RESPONSE:

This recommendation should refer to snow roads, not winter roads. In the event that there is a heavy, early snow fall, we may want to start

inducing frost penetration before there is 4 inches of natural frost penetration, we may want to manufacture snow.

ALTERNATIVE RECOMMENDATION:

7. Snow road preparation shall not begin before frost has penetrated at least 8 inches into the ground and 4 inches of snow has accumulated. However, the acceleration of frost penetration and the manufacturing or hauling of snow shall be permitted by the Agency. Equipment type and use must be approved by the Agency.

3. Recommendation 8. The response should read as follows:

RESPONSE:

This recommendation is too restrictive. In certain circumstances, shallow, gravel bottomed streams for example, it may be environmentally preferable to cross through the stream, rather than provide a temporary crossing structure.

ALTERNATIVE RECOMMENDATION:

8. An Agency approved temporary crossing structure may be required for certain crossings of unfrozen streams, either during the preparation of snow roads or during the construction of the pipeline.

Construction Services and Activities

Borrow Operations

4. Recommendation 19. The responses should read as follows:

RESPONSE:

Recommendations 19.a, 19.d, and 19.e are acceptable.

Recommendation 19.b is not acceptable as written.

Recommendation 19.c is not acceptable as written, but would be acceptable if the word "conclusive" was removed.

Recommendation 19.f is not acceptable and should be deleted since the data required would have to be collected through a major research program over more than a few years in order to obtaining significant mean yearly rates.

ALTERNATIVE RECOMMENDATION:

19. b) Plans for getting machines to the mining sites without unacceptably damaging the terrain.

19. c) Biological evidence showing that the proposed scheme is not harmful to the fish resources of the river.

19. f) Delete.

5. Recommendation 22. The suggestion to delete this recommendation (for reasons outlined in the response) was inadvertently omitted.

6. Recommendation 26. The response should read as follows:

RESPONSE:

Recommendations 26 (a) and (d) are acceptable. Recommendations (b) and (c) are unacceptable as written but are acceptable with rewording shown in Alternative Recommendations. In recommendation 26 (e) the phrase "near the mouths" is not clearly defined in terms of distance.

ALTERNATIVE RECOMMENDATION:

26. (b) The Company must demonstrate that the proposed activity will be scheduled to accommodate shipping, fishing or other traditional human activities.

26. (c) The Company must show that the proposed activity does not unacceptably disturb any sensitive area and does not take place at a sensitive time for fish.

26. (e) Dredging in the vicinity of significant tributary rivers would only be undertaken with the approval of the Agency.

PROJECT DESIGN AND CONSTRUCTION

TABLE OF CONTENTS

LOCATION AND ROUTING

- Prudhoe Bay Lateral
- Mackenzie Valley Pipeline

SCHEDULING AND LOGISTICS

PIPELINE AND FACILITIES

- Grading & Ground Protection
- Vegetation Clearing
- Snow Roads
- Geo-Technical
- Frost Heave & Thaw
- Pipe Uplift
- Slope Stability
- Drainage & Erosion
- River Crossings Design
- Revegetation
- Crossings, Definitions
- Crossings, Construction
- Crossings, Monitoring
- Location of Facilities
- Camps, Wharfs, Stockpile Sites
- Roads, Airstrips, Helipads
- Compressor Station Noise
- Blowdown Noise

CONSTRUCTION SERVICES & ACTIVITIES

- Borrow Operations
- Blasting
- Wastewater & Sewage
- Solid Wastes
- Solid/Liquid Wastes Const. & Ind.
- Water Supplies & Intakes
- Pipe Testing
- Spill Prevention & Control
- Fire Prevention & Control

PROJECT REGULATION

- The Government
- The Company
- Enforcement
- Environ. & Social Training

PROJECT OPERATION

- Introduction
- Line Patrol and Inspection
- Routine Maintenance
- Transportation Requirements
- Deactivation
- Regulation

LOCATION AND ROUTING

- Prudhoe Bay Lateral
- Mackenzie Valley Pipeline

RECOMMENDATIONS

General Routing

1. In the context of the regional socio-economic and environmental considerations that constitute the focus of this Inquiry, it is recommended that the Prudhoe Bay gas pipeline should not cross the Northern Yukon, but rather should follow a more southerly route or corridor. In this connection the Northern Yukon includes both the Arctic Gas Coastal route (via the Cross-Delta or Circum-Delta options) and the Arctic Gas Interior route. This recommendation stems from the major difficulties that would be involved in protecting the environment and the people of Old Crow from the impact of development, and applies to the gas pipeline project, per se and also to development of an energy transportation corridor that could follow the route of the pipeline.

Response:

Not acceptable. No detailed studies of this route have been done and no evidence has been presented to suggest that it would be preferable. Rationale for the proposed Cross-Delta and Circum-Delta Routes has been thoroughly examined before the Commission and does not lead to the conclusions set out in the recommendations.

Alternative Recommendation - Delete

2. Based on the limited review by this Inquiry of the alternative pipeline corridors for a pipeline across the Yukon Territory as put forward by Arctic Gas, the "Fairbanks Corridor" along the Alaska Highway offers environmental advantages over the routes across the Northern Yukon.

Response:

Response to this recommendation is covered in the Chapter on environmental recommendations.

Coastal Route

3. If a permit were to be granted for a trunk gas pipeline from Alaska along the Yukon Coastal Plain, the Government of Canada concurrently should adopt a policy of preserving in its natural state as much as possible of this unique area and of providing maximum protection to wildlife and fish. The following measures are recommended for implementation under this policy.

The Company shall:

- a) submit to the Agency, for approval and direction at preliminary design, a rationalization and optimization of its route and facilities locations in terms of potential impact on birds, mammals, fish and traditional land use by native people, including environmental, engineering and cost comparison of alternative right-of-way, borrow and facilities locations. This analysis is to include, as one possibility, a route through the already disturbed areas at and around DEW line sites (136:20605-26);

Response:

These items have been examined at length before the Commission and have or will be examined again before the NEB. To rework all this material after a permit has been granted would serve no useful purpose and would unreasonably delay activities.

Alternative Recommendation- Delete

- b) strictly adhere to the winter construction and snow road logistic mode (i.e. no permanent road or gravel work pad along the right-of-way);

Response: Acceptable

- c) reduce summer-time activities, during construction and operation, to an absolute minimum, and allow flexibility in timing of any necessary summer activities;

Response: Acceptable

- d) apply conservative design and construction practices along the full length of the coastal plain so as to minimize the need for repairs and particularly contingency repairs;

Response: Acceptable

It is submitted that the proposed design is sufficiently conservative to accomplish the intent of this recommendation.

- e) follow a surveillance and maintenance program during pipeline operation that is specifically designed to avoid impact on mammals and birds; and

Response: Acceptable

- f) meet the concerns for protection of birds, mammals and fish outlined for this area in "Protection of Wildlife" and "Protection of Fish". Special attention should be given to control of aircraft and particularly helicopters, protection of the Porcupine caribou herd in the calving and post-calving period, protection of staging snow geese in autumn, and protection of overwintering fish in rivers.

Response: Acceptable

The Government should:

- a) place restraints on ongoing industrial and government activities and ongoing use of aircraft throughout the coastal plain and adjoining nearshore zone comparable to the restraints placed on the pipeline project. These restraints should apply through the construction period and be re-evaluated thereafter;

No Response

- b) set aside as provisional land reserves, the Yukon Coastal Plain and, in more general terms, the whole of the northern Yukon between the coast and the Porcupine River (i.e. the area of the proposed International Wildlife Range) in accordance with the recommendations contained in "Land Reserves";

No Response

Location and Routing
Prudhoe Bay Lateral

- c) under this reserve and pending formal disposition of the reserved area, prevent or curtail new industrial activities;

No Response

- d) prohibit entry on to the Yukon Coastal Plain for hunting or fishing except by native people engaged in traditional land uses. These restraints should apply through the construction period and be re-evaluated thereafter.

Response: Acceptable

The construction will be scheduled so that it will not unduly impact on normal use of the land by native people.

Cross-Delta Route

- 4. If a permit were to be granted for a trunk gas pipeline from Alaska across the Mackenzie Delta, the Government of Canada should indicate in unequivocal terms that approval of the gas pipeline does not constitute approval of an energy transportation corridor across the delta and is not to be taken as a precedent for routing a trunk oil pipeline across the delta. In addition, the government should ensure, as a matter of policy, that the pipeline company will achieve high standards of protection of wildlife, fish, land and water. The measures outlined below are further recommended in this regard. The Company shall:

- a) submit to the Agency, for approval and direction at preliminary design, a rationalization and optimization of its route and facilities locations on the delta in terms of potential impact on birds, mammals, fish and traditional land use activities by native people, including environmental, engineering, and cost comparison of alternative right-of-way and facilities locations; this analysis is to include the "Barry Route" as well as other options (122:18584-87, 18725-26);

Response: Unacceptable (for the same reasons as 3(a))

The "Barry Route" has not been studied in depth and there is no evidence to suggest that this route is environmentally preferable.

Alternative Recommendation - Delete

- b) unless the "Barry Route" is adopted, build the crossing of Shallow Bay in winter to avoid the effect of summer construction on whales, staging snow geese and other waterfowl;

Response: Unacceptable

It is possible to construct the Shallow Bay crossing in summer without adverse impact on whales, staging snow geese and other waterfowl. Arctic Gas has committed to shut down construction if such impact occurs.

Alternative Recommendation - Delete

- c) strictly adhere to winter construction with snow road logistics for all segments of the pipeline on the modern Mackenzie Delta with the exception of crossings (i.e. not summer construction of gravel work pad along the right-of-way);

Response: Acceptable

- d) reduce summer-time activities during construction and operation to a minimum and allow flexibility in the schedule of any summer activities that are necessary;

Response: Acceptable

- e) apply conservative design and construction practices to the pipeline within the Mackenzie Delta to minimize contingencies and the need for repairs, use dual pipe in all areas potentially subject to flooding, provide for continuous weighting of the pipe, and install cross overs between the two pipes;

Response:

Arctic Gas plans dual crossings across the Delta but submits that the length used and other matters addressed in this recommendation are matters that should be left for final design.

Alternative Recommendation - Delete

- f) limit the quantity of fuel stored at any one place and time within the delta, as outlined in "Spill Prevention and Control";

Response: Acceptable

Subject to the proviso that proposed revisions to the applicable sections on "Spill Prevention and Control" are accepted.

- g) follow a surveillance and maintenance program during pipeline operation that is specifically designed to avoid impact on mammals and birds, including limitations on use of aircraft hovercraft, and boats during summer (see "Project Operation").

Response:

Acceptable subject to the proviso that proposed revisions to the applicable sections on "Project Operation" are accepted.

- h) meet the concerns for protection of birds, mammals, and fish outlined for the Mackenzie Delta in "Protection of Wildlife" and "Protection of Fish"; special attention should be given to control of aircraft and particularly helicopters, handling of fuel, protection of white whales, and protection of staging snow geese; and
- i) avoid contact and conflict with hunting, trapping, and fishing activity by native people.

Response:

Acceptable subject to the proviso that proposed revisions to the applicable sections on "Protection of Wildlife" and "Protection of Fish" are accepted.

Response: (4) i. Acceptable

The Cross-Delta route is the most preferable from this standpoint.

The Government should:

- a) withdraw as provisional land reserves, the whale sanctuary and waterfowl reserve areas recommended in "Land Reserves";

No response

- b) pending formal disposition of these reserved areas, apply restraints to or relocate existing industrial and governmental activities, including use of aircraft and barges, within these reserved areas comparable to the measures specified in this report for protection of whales and water fowl. Also, pending formal disposition of these reserved areas, the government should curtail or prevent new industrial activities that could place at risk the whales and birds that the reserves are designed to protect;

Response: Acceptable

Subject to the proviso that proposed revisions to applicable sections on protection of whales and waterfowl are accepted.

- c) within a zone extending 5 miles on either side of the pipeline route across the delta, place restraints on industrial and governmental activities (including use of aircraft) comparable to the restraints placed on the pipeline project: this condition should apply through the period of pipeline construction and should be re-evaluated thereafter;

Response: Acceptable

- d) establish a general policy of regulating industrial development in the delta so as to afford maximum protection to wildlife and fish, and to preserve as much of the delta as possible in its natural state.

Response: Acceptable

Circum-Delta Route

5. If a permit were to be granted for a trunk gas pipeline from Alaska around the west side of Mackenzie Delta via the Arctic Gas prime route of March 1974 (Circum-Delta route) the location of the pipeline, pipeline facilities and all other related land use should be adjusted to avoid encroaching upon all areas of special importance to the native people of Aklavik, Fort McPherson and Arctic Red. Adjustments should also be made to avoid interference with fishing, trapping and hunting by the local people and to meet the environmental concerns about this route that are identified elsewhere in this submission .

Response: Unacceptable

Arctic Gas submits that the Cross-Delta Route proposed is preferable in that it would avoid the problems suggested. In the event that the Circum-Delta route is approved all reasonable steps will be taken to avoid conflict with activities of native people.

Alternative Recommendation

"If a permit were to be granted for a trunk gas pipeline from Alaska around the west side of Mackenzie Delta via the Arctic Gas prime route of March 1974 (Circum-Delta route) the location of the pipeline, pipeline facilities and all other related land use should be examined to determine such reasonable alternatives as would avoid encroaching upon all areas of special importance to the native people of Aklavik, Fort McPherson and Arctic Red. Adjustments should also be examined to determine such reasonable alternatives as would avoid interference with fishing, trapping and hunting by the local people and to meet the environmental concerns about this route that are identified elsewhere in this submission."

6. At preliminary design, the company should submit to the agency proposals (with alternatives) for adjustments in route and in location of facilities etc. (and/or adjustments in procedures and schedules) to achieve the above. Particular reference should be made to:
 - a) avoiding interference with domestic fishing in Mackenzie Delta channels (e.g. "Big Eddy"), Rat River, Peel River, and Mackenzie River near Arctic Red;
 - b) avoiding disturbance of fish in localities critical to fish populations including Willow River, Rat River and Big Fish River;
 - c) moving the compressor station and associated facilities away from Rat River;
 - d) minimizing disturbance of the Mount Goodenough Dall sheep population; and;
 - e) minimizing disturbance of lands and waterbodies within the Mackenzie Delta and similar terrain along Peel River (work pads, wharves, storage areas, roads, right-of-way), including limitation of the amount of fuel stored in areas subject to flooding.

Location and Routing
Prudhoe Bay Lateral

Response: Unacceptable

Alternative Recommendation

At preliminary design the company shall submit to the agency such proposals for adjustments in route, location of facilities and schedules as it has found to be feasible. Particular reference should be made to:

- a)
- b)
- c) as proposed
- d)
- e)

Interior Route

7. In the context of the regional socio-economic and environmental considerations that constitute the focus of this Inquiry, it is recommended that the Prudhoe Bay gas pipeline should not follow the "Interior route" proposed by Arctic Gas or pass through this region. This recommendation is directed principally to that part of the Interior route between the Alaska border and the Peel River and reflects both the overwhelming opposition of the Old Crow people and the substantial environmental concerns about this pipeline, particularly concerning the Porcupine caribou herd. This recommendation applies to the gas pipeline per se and to the concept of an energy transportation corridor following the route of the pipeline.

Response: Unacceptable

Arctic Gas submits that either of the routes proposed (Cross-Delta & Circum-Delta) are superior to the interior route and that this route should be given no further consideration.

Alternative Recommendation - Delete

8. Should the Government of Canada seriously consider granting a right-of-way for a trunk gas pipeline through the region traversed by the Interior route proposed by Arctic Gas, then it is recommended that a route diversion well south of Old Crow (Templeton,

Location and Routing
Prudhoe Bay Lateral

108:16529) should be reviewed in terms of its acceptability to the people of Old Crow (as well as its technical feasibility and acceptability to the Company) prior to reaching any final decision.

Response: Unacceptable (for same reason as number 7)

Alternative Recommendation - Delete

9. If a permit were to be granted for a trunk gas pipeline from Alaska across the northern interior of the Yukon Territory (assuming an agreement were to be reached with the Old Crow people), the Government should:
 - a) ensure that the pipeline logistic system and pipeline related traffic of all kinds avoid, in a manner acceptable to the local people, Old Crow and the areas traditionally used by Old Crow residents for the harvest of renewable resources
 - b) ensure that the pipeline is built in winter using snow road logistics and that permanent gravel roads are kept to an absolute minimum, as a means of further limiting access to the region;
 - c) prohibit hunting and fishing within 5 miles of the Pipeline, its access routes, and pipeline facilities, with the exception of traditional land use by native people. This restraint should be applied through the construction period and be re-evaluated thereafter; also similar no hunting zones should be enforced along the Dempster Highway and other roads or winter trails as deemed necessary to protect the Porcupine caribou herd during pipeline construction (see "Game Management and Monitoring");
 - d) place restraints on aircraft flights and any other industrial or governmental activities within 5 miles of the pipeline route comparable to the restraints applicable to the pipeline project. These restraints should be applied throughout the pipeline construction period and be re-evaluated thereafter;
 - e) set aside as a provisional land reserve, the area north of the Porcupine River within the boundaries of the proposed International Wildlife Range in accordance with the recommendations contained in "Land Reserves"; and

Location and Routing
Prudhoe Bay Lateral

- f) ensure that both the construction and the operation of the pipeline meet the concerns for protection of birds, mammals and fish outlined for this area in "Protection of Wildlife" and "Protection of Fish".

Response:

Not acceptable for same reasons as 7 but with the further comment that the assumption that approval would have to be based on an agreement with the people of "Old Crow" would be completely unacceptable. This would effectively give them power of veto and would probably preclude construction of the pipeline.

RECOMMENDATIONS

1. If a gas pipeline from Prudhoe Bay across the southern Yukon is under serious consideration, then the Dempster Highway route should be assessed and reviewed, on a priority basis, as an alternative to the Mackenzie Valley route for transport of gas (and as an energy transportation corridor) southward from the Mackenzie Delta. As noted in the foregoing, a gas pipeline along the Dempster Highway could have advantages over a pipeline through the Mackenzie Valley both environmentally and perhaps for native people (although the Inquiry has heard only general information about this route).

Response: Unacceptable

There is no application before any authority to build on this route. Evidence presented demonstrates that it is less desirable from engineering and environment standpoints.

Alternative Recommendation - Delete

2. Apart from the Dempster Highway system cited above, there is no obvious and environmentally advantageous alternative to the Mackenzie Valley for routing of a gas pipeline and an energy transportation corridor southward from Mackenzie Delta.

Response: Unacceptable

Arctic Gas submits that there is no evidence to support the contentions that the Dempster route is an environmentally advantageous alternate to the Mackenzie Valley route.

Alternative Recommendation - Delete

3. Routing of the Mackenzie Valley pipeline and the location of all lands to be used by the pipeline project should be adjusted to stay away from the small Dene communities along the valley, and to avoid encroaching upon all other areas of special importance to the native people. Review of the options available to meet this need, by government, local people and the Company, should include the possibility of locating the pipeline west of the Mackenzie River.

Response: Unacceptable

Location and Routing
Mackenzie Valley Pipeline

Arctic Gas submits that all feasible routes have been examined to the extent reasonable and that the route should be selected on the basis of the evidence submitted. Minor revisions designed to alleviate conflict with the communities should be considered. This can be covered in proposal 4 (L).

Alternative Recommendation - Delete

4. The routing of the Mackenzie Valley pipeline and location of all lands proposed for use by the pipeline should be adjusted to reduce potential environmental impact. In this regard, at preliminary design, the Company shall submit to the Agency for review and approval its proposals for modifying the route and locations to meet the environmental concerns. Where deemed appropriate by the Agency, these proposals will include comparison of alternative locations in terms of engineering and cost as well as environmental and social factors: In particular Company proposals should deal with the following matters:
 - a) Adjustment of the location of compressor stations and of the groups of facilities associated with the compressor stations so as to stay away from valleys and rivers tributary to the Mackenzie and the mouths of tributaries (see "Location of Facilities"). If a compressor station cannot be moved, then the associated facilities (wharf, stockpile site, airfield, borrow pits, road, camp, sewage plant, and wastedump) shall be kept away from the tributary valleys, tributary rivers and their mouths.
 - b) Adjustment of the location of wharves and stockpiles along the Mackenzie River to avoid interference with fishing sites.
 - c) Modification of the location of the Swimming Point crossing the East Channel and avoidance of the nearby pipe and road crossings of Holmes Creek (Foothills) to reduce potential impact on the Holmes Creek fishery.
 - d) Adjust the location of various stream crossings to avoid areas of fish sensitivity. Some locations of this kind are recorded in "Site-Specific Recommendations: Fish".

Location and Routing
Mackenzie Valley Pipeline

- e) Modification of location of borrow pits to avoid potential borrow resource conflicts (see "Borrow Resources").
- f) Adjustment of route and locations and established aircraft flight corridors to meet the concerns outlined in "Wildlife Protection".
- g) Avoid areas designated as important for recreation (see Recreation Areas").
- h) Relocation of the pipeline, access routes and roads, facilities and borrow pits insofar as possible on already disturbed ground.
- i) Adjustment of the pipeline route to minimize the length of pipeline on terrain that is potentially troublesome in terms of frost heave, thaw settlement, slope stability, buoyance and erosion.
- j) Review on a mile basis of location of the pipeline and associated facilities in relation to the Mackenzie Highway route in terms of potential separate and cumulative environmental impact and propose pipeline and/or highway relocations designed to minimize such impact.
- k) Adjustment of the pipeline route and locations to avoid conflict with areas proposed or set aside as provisional land reserves (see "Land Reserves").

Response: To number 4 Unacceptable

Alternative Recommendation

The proposed routing of the Mackenzie Valley pipeline should be examined by the Company with a view to determining if there are reasonable alternatives which will reduce potential environmental and social impact. At the preliminary design stage, the Company shall submit to the Agency for review and approval its proposals in this regard. In particular Company proposals should deal with the following matters:

(a) through(k) is acceptable as written

Add (L) Adjustment of pipeline location where feasible to reduce impact on native communities along the Valley.

1. Scheduling and Logistics

2. Scheduling and Logistics

3. Scheduling and Logistics

4. Scheduling and Logistics

5. Scheduling and Logistics

SCHEDULING AND LOGISTICS

6. Scheduling and Logistics

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8. Scheduling and Logistics

9. Scheduling and Logistics

10. Scheduling and Logistics

11. Scheduling and Logistics

12.

Scheduling and Logistics

RECOMMENDATION:

1. Upon receiving pipeline route approval, the Company shall demonstrate the technical feasibility and environmental acceptability of the proposed construction schedules and logistics by submitting to the Agency for approval:
 - a) preliminary construction and logistics plan for each spread; and
 - b) a preliminary contingency scheduling and logistics plan for each spread.

RESPONSE:

Acceptable.

RECOMMENDATION:

2. As part of its final design submission to the Agency and prior to commencing any work (apart from clearing) on any spread, the Company shall provide the government with a finalized sequential activity analysis. The analysis shall include all the activities related to construction and all the environmental and other constraints which might occur with the course of action (contingency plan) that will be followed if such constraints do arise.

RESPONSE:

Acceptable.

Scheduling and Logistics

RECOMMENDATION:

3. During construction the Company shall prepare for the Agency a monthly construction progress report for each spread or part thereof as prescribed by the Agency. It shall describe:
 - a) construction progress to date on each spread keyed to an updated sequential activity program;
 - b) construction delays and proposed methods for overcoming these delays including a revised forecast of project scheduling and activities showing how all physical constraints and all stipulations will be met;
 - c) the physical conditions of snow and ice roads; and
 - d) any actual or planned additions to the work force accommodated in construction camps and other camps.

RESPONSE:

Acceptable.

RECOMMENDATION:

4. In order to enact scheduling and/or logistics modifications, or if the monthly progress reports show variations to the original activity plans, the Company shall submit a revised plan to the Agency for approval. In particular, the Agency may request the Company to submit a schedule on the basis of a worst case scenerio, as outlined by the Agency. The schedule shall show how the Company would deal with the worst case schedule and comply with the project stipulations.

RESPONSE:

Not acceptable.

Scheduling and Logistics

ALTERNATIVE RECOMMENDATION:

4. In order to enact scheduling and/or logistics modifications or if the monthly progress reports show variations to the original activity plans the Company shall submit a revised plan to the Agency for approval.

RECOMMENDATION:

5. The Agency's field inspector shall have the authority to delay or close down work on a construction spread when schedules and logistics plans or activities deviate from the approved plans in a way which may lead to an environmentally unacceptable situation.

RESPONSE:

Not Acceptable.

ALTERNATIVE RECOMMENDATION:

5. The Agency shall have the authority to delay or close down work on a construction spread when schedules and logistics plans or activities deviate from the approved plans in a way which violates environmental regulations established by the Agency.

Scheduling and Logistics

RECOMMENDATION:

6. The Company must notify the Agency's field inspector of proposed activities at least 48 hours before the particular operation takes place. If monitoring is to be undertaken by an independent source, notification must take place 72 hours before the operation takes place.

RESPONSE:

The Company will provide to the Agency a plan of all proposed activities and this should provide adequate notice for most activities.

ALTERNATIVE RECOMMENDATION:

6. The Agency will stipulate to the Company which proposed activities will require at least 48 hours notice before the particular operation takes place. The Agency will advise the Company which operations will require monitoring to be undertaken by an independent source and the Company shall give notification to the Agency 72 hours before the operation takes place.

PIPELINE AND FACILITIES

- Grading & Ground Protection
- Vegetation Clearing
- Snow Roads
- Geo-Technical
- Frost Heave & Thaw
- Pipe Uplift
- Slope Stability
- Drainage & Erosion
- River Crossings Design
- Revegetation
- Crossings, Definitions
- Crossings, Construction
- Crossings, Monitoring
- Location of Facilities
- Camps, Wharfs, Stockpile Sites
- Roads, Airstrips, Helipads
- Compressor Station Noise
- Blowdown Noise

Pipeline and Facilities
Grading and Ground Protection

RECOMMENDATION: (Page 3)

1. In constructing the pipeline, the Company shall adopt techniques which minimize disturbance to or destruction of the ground surface vegetation mat. Company designs and construction methods shall minimize the uses of cuts and grading of the ground surface in all sensitive permafrost areas.

RESPONSE:

Acceptable.

Pipeline and Facilities
Grading and Ground Protection

RECOMMENDATION: (Page 3)

2. Construction of the pipeline north of 60°N shall be done in winter from a snow work pad ("arctic" construction mode of Arctic Gas) and work from a graded right-of-way surface (conventional construction mode of Arctic Gas) shall be used only where authorized by the Agency (in answer to a Company request) in areas of stable ground.

RESPONSE:

The approval of the construction mode to be utilized in any area should be made in the final design stage. The recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

2. Construction of the pipeline north of 60° shall be done in winter from a snow work pad ("arctic" construction mode of Arctic Gas) and work from a graded right-of-way surface (conventional construction mode of Arctic Gas) shall be used only in areas of stable ground where authorized by the Agency in Final Design Approval.

Pipeline and Facilities
Grading and Ground Protection

RECOMMENDATION: (Page 3)

3. Construction of the pipeline at any time of year other than winter (e.g. summer or autumn) and/or from a gravel-fill work pad shall be permitted only where approved by the Agency based upon a submission by the Company demonstrating the need for and advantage of this departure.

RESPONSE:

Approvals of summer construction of major water crossings are handled in other sections, therefore the recommendation should be revised as follows:

ALTERNATIVE RECOMMENDATION:

3. Construction of the pipeline (other than major river or water crossings) at any time of year other than winter (e.g. summer or autumn) and/or from a gravel-fill work pad shall be permitted only where approved by the Agency based upon a submission by the Company demonstrating the need for and advantages of this departure.

Pipeline and Facilities
Grading and Ground Protection

RECOMMENDATION: (Page 3)

4. As part of the final design, the Company shall submit detailed plan and profiles of the right-of-way indicating the construction method proposed for each part of the pipeline. This submission should show:
- a) the depth and width of all cuts in the right-of-way;
 - b) the width of the right-of-way that will be disturbed by grading, ditching, spoil storage and backfilling;
 - c) the thickness and width of all fills and embankments;
 - d) when, how and with what equipment each part of the pipeline is proposed to be built; and
 - e) the general nature of all drainage and erosion control devices proposed for each part of the right-of-way.

Similar plans and profiles should be submitted for all access roads, trails and shoo-fly roads.

The plans should be on a contoured orthophoto base, at a scale of not less than 1 inch to 1000 feet, with a contour interval of 5 feet. Similar plans should be provided for all facilities related to the construction and operation of the pipeline.

RESPONSE:

This recommendation should be separated into two parts, one dealing with the arctic construction mode and one dealing with the conventional winter construction mode. In the arctic construction mode sub-items (a) (b) and (c) are acceptable.

Sub-item (d) is too detailed in that "with what equipment" is too detailed and a general list of equipment to be utilized should be satisfactory at the Final Design stage. Every advantage should be

taken of input from contractors on equipment performance and this may not be finalized until after the Final Design stage. Sub-item (e) is satisfactory.

Plans and profiles should be submitted for all access roads, trails and shoo-fly roads showing the locations of cuts and embankments if required.

For conventional winter construction, in areas of stable ground, it should not be necessary to detail areas of cuts and fills and embankments since these will normally be replaced. If they were not to be replaced approval should be secured from the Agency.

Arctic Gas has secured orthophoto mosaics over a considerable portion of the route on a metric scale. These scales are at 1:10,000 horizontally and with a 2 1/2 meter contour interval, approximately 8.2 ft.). These scales should be satisfactory for all construction and operation of the pipeline.

The recommendation should be in two parts and read as follows:

ALTERNATIVE RECOMMENDATION

4. (a) As part of the final design for areas of arctic construction the Company shall submit detailed plan and profiles of the right-of-way indicating the construction method proposed for each part of the pipeline. This submission should show:
 - (1) the depth and width of all cuts in the right-of-way;
 - (2) the width of the right-of-way that will be disturbed by

- grading, ditching, spoil storage and backfilling;
 - (3) the thickness and width of all fills and embankments;
 - (4) the timing, a description of the construction technique, and a general description of the construction equipment to be utilized.
 - (5) the general nature of all drainage and erosion control devices proposed for each part of the right-of-way;
 - (6) plans and profiles for all access roads, trails and shoo-fly roads showing the location of cuts and embankments where required.
- (b) As part of the final design for conventional winter construction the Company shall submit detailed plan and profiles of the right-of-way indicating the construction method proposed for each part of the pipeline. This submission should show:
- (1) the width of the right-of-way that will be disturbed by grading, ditching, spoil storage and backfilling;
 - (2) the timing, a description of the construction technique, and a general description of the construction equipment to be utilized.
 - (3) the general nature of all drainage and erosion control devices proposed for each part of the right-of-way;
 - (4) plans showing the location of all access roads, trails and shoo-fly roads.

(c) The plans for above should be on a metric scale of 1:10,000 horizontally (approximately 1 inch = 830 ft.) with a 2 1/2 meter contour interval (approximately 8.2 ft.).

Pipeline and Facilities
Grading and Ground Protection

RECOMMENDATION: (Page 4)

5. Grading of the right-of-way shall not be done more than three months ahead of the construction of any section of the pipeline except where authorized by the Agency.

RESPONSE:

In some cases access to compressor station sites will be by access roads along the right-of-way. In many cases these sites are utilized for pipeline construction camps and will be constructed one or more years before pipeline construction. The recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

5. Right-of-way grading, one or more seasons in advance of pipeline construction, will be permitted in non-permafrost areas and thaw-stable permafrost areas where the right-of-way is used for access for construction of compressor stations, landing strips, pre-consolidation berms in muskeg, and other like facilities.

All other right-of-way grading will be performed in the same winter construction season that pipeline installation takes place on a spread by spread basis.

Pipeline and Facilities
Vegetation Clearing

Preliminary Design

RECOMMENDATION: (Page 2)

1. As part of the preliminary design the Company shall provide its plans for right-of-way clearing. These plans shall include information on:
 - (a) the location of all areas to be cleared;
 - (b) the methods proposed to clear these areas, including disposal;
 - (c) the timing of clearing with respect to the pipeline construction schedule;
 - (d) fire protection measures;
 - (e) areas of merchantable timber, its harvest and disposal; and
 - (f) interim terrain stabilization measures.

RESPONSE:

At the preliminary design stage, detailed field investigations will not have advanced far enough to provide all of the above information. This recommendation should be in more general terms and read as follows:

ALTERNATIVE RECOMMENDATION:

1. As part of the preliminary design the Company shall provide its plans for right-of-way clearing. These plans shall include information on:
 - (a) the location of all areas to be cleared;
 - (b) a description of the proposed methods to be utilized in clearing and an initial assessment of where each method will be used;

- (c) an estimate of the timing of clearing with respect to the pipeline construction schedule;
- (d) a description of proposed fire protection measures;
- (e) an estimate of areas of merchantable timber, and a description of the methods proposed for harvest and disposal; and
- (f) a description of the proposed interim terrain stabilization measures.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 2)

2. All clearing boundaries to be marked prior to the commencement of clearing activities.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

3. No vegetation shall be cleared from outside the clearing boundaries (with the exceptions noted in 4) and all blazed, pointed or posted trees which are on or within, or mark, clearing boundaries are reserved from cutting and removal.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

4. Dangerous trees and snags with their base outside the clearing boundaries but leaning into the cleared area shall be removed using hand tools.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

5. Only the minimum area necessary for the construction of the pipeline or any particular appurtenance shall be cleared.

RESPONSE:

Clearing will be required in some areas for other reasons. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

5. Clearing shall be limited to the minimum area necessary for:
 - (a) construction of the pipeline and appurtenances;
 - (b) appropriate fire guards;
 - (c) operation of the pipeline such as approaches to airstrips.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

6. Along those sections of the right-of-way where alternate access is required, the width of the right-of-way to be cleared shall be the full width (120 feet) less an amount equal to the width of the access road. Sections of the right-of-way where cuts are required are executed.

RESPONSE:

We agree with the intent, but believe it would be clearer written as follows:

ALTERNATIVE RECOMMENDATION:

6. Along those sections of the right-of-way where alternative access is required, the width of right-of-way to be cleared shall only be that width necessary for pipeline construction.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page3)

7. The cleared width of alternate access shall not exceed 50 feet.

RESPONSE:

There will be areas where additional widths will require clearing on alternate access roads. The recommendation should read:

ALTERNATIVE RECOMMENDATION:

7. The cleared width of alternate access shall not exceed 50 feet, except in areas of cut or fill where additional width may be required.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

8. Clearing may be performed either by hand or machine, subject to the provisions that follow. The methods chosen will be those which minimize disturbance of the surface vegetation and organic layer.

RESPONSE:

Not Acceptable. This recommendation should be reworded as follows:

ALTERNATIVE RECOMMENDATION:

8. Clearing may be performed either by hand or machine, subject to the provisions that follow. The methods chosen will be those which only create acceptable disturbance of the surface vegetation and organic layer.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

9. All bulldozer blades shall be equipped with mushroom shoes (except in those areas where grading will be allowed) and all equipment used in clearing shall be adequately powered.

RESPONSE:

Not Acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

9. All bulldozer blades used in clearing shall be equipped with mushroom shoes (except in those areas where grading will be allowed) and all equipment used in clearing shall be adequately powered.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendation

RECOMMENDATION: (Page 3)

10. The period between the initiation of disturbance by clearing and the implementation of erosion control procedures shall be as short as practicable. Clearing two winter seasons in advance of construction is not acceptable.

RESPONSE:

Right-of-way clearing may be required well in advance of construction where the right-of-way is used for access to station sites.

The recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

10. The period between the initiation of disturbance by clearing and the implementation of erosion control procedures shall be as short as practicable. Right-of-way clearing more than one season in advance of pipeline construction is not acceptable except in cases where the right-of-way is used for access for construction of compressor station pads, airstrips, and berms to pre-consolidate muskeg etc.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

11. Where the right-of-way will be cleared a year in advance of construction, there shall be no clearing of vegetation from river and stream banks, valley walls and slopes greater than 6° except for that required to allow the movement of men and equipment.

RESPONSE:

The 6° limitation on slopes is too restrictive. The recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

11. Where the right-of-way will be cleared a year in advance of construction, there shall be no clearing of vegetation from river and stream banks, and valley walls and slopes greater than 6° in sensitive permafrost. Clearing will be allowed on slopes greater than 6° in stable areas. Clearing required for the movement of men and equipment will be allowed in all areas.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 3)

12. The clearing of sensitive permafrost areas shall be delayed until just prior to construction.

RESPONSE:

This recommendation is too restrictive and should read as follows:

ALTERNATIVE RECOMMENDATION:

12. The clearing of sensitive permafrost areas may proceed at any time during the winter construction season that pipeline installation takes place on a spread by spread basis.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION:

13. Machine clearing will be restricted to the winter construction season and shall not begin before there is 8 inches of frost penetration and 4 inches of snow cover. The shutdown of clearing operations in the spring will be at the discretion of the Agency. Hand clearing can take place at anytime subject to prior approval by the Agency.

RESPONSE:

This recommendation is too restrictive for conventional winter construction. With this construction mode grading is allowed and it is not necessary to wait for 8 inches of frost penetration. The recommendation should read:

ALTERNATIVE RECOMMENDATION:

13. Machine clearing will be restricted to the winter construction season. The shutdown of clearing operations in the spring will be at the discretion of the Agency. Hand clearing can take place at anytime subject to prior approval by the Agency.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

14. All clearing required for location surveys, and especially that required for the testing of borrow, shall be by hand.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

15. Areas, such as the approaches to aircraft runways or the perimeter of compressor station sites, where no other activity than clearing is required, shall be hand cleared to minimize disturbance of the vegetation and organic mat.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

16. All river and stream banks, valley walls and slopes greater than 6° will be hand cleared.

RESPONSE:

Not acceptable. The recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

16. All river and stream banks and valley walls will be hand cleared.

Winter clearing by machine of slopes greater than 6° should be allowed for conventional winter construction where grading is allowed.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

17. All vegetation at the tops of cuts will be hand cleared.

RESPONSE:

In some cases machine clearing should be allowed. The recommendation should read:

ALTERNATIVE RECOMMENDATION:

17. All vegetation at the tops of cuts will be hand cleared, where a potential for erosion or instability exists.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

18. Winter trails and all other temporary access will be hand cleared.

RESPONSE:

Machine clearing should be allowed in stable areas. The recommendation should read:

ALTERNATIVE RECOMMENDATION:

18. Winter trails and all other temporary access will be hand cleared in areas where a potential for erosion or instability exists. In stable areas machine clearing will be allowed.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION:

19. There will be no traffic on unprepared surfaces during the thaw season.

RESPONSE:

The recommendation should read:

ALTERNATIVE RECOMMENDATION:

19. There will be no traffic on unprepared unstable surfaces during the thaw season.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

20. No grubbing or disturbance of the ground surface (e.g. removal of the organic mat, levelling of hummocks etc.) to facilitate vehicle movement, either along the right-of-way or along access roads, shall be allowed during the clearing phase. Grubbing and grading of the right-of-way in areas of conventional construction shall not take place until the winter season of construction.

RESPONSE:

This recommendation should be more specific for arctic construction areas and should read as follows:

ALTERNATIVE RECOMMENDATION:

20. No grubbing or disturbance of the ground surface (e.g. removal of the organic mat, levelling of hummocks etc.) to facilitate vehicle movement, either along the right-of-way or along access roads, shall be allowed during the clearing phase, in areas where the arctic construction mode is to be employed. Grubbing and grading of the right-of-way in areas of conventional construction shall not take place until the winter season of construction.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

21. Where ground disturbance has occurred, inadvertantly or otherwise, interim stabilization measures may be required.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

22. All trees, brush and other woody material cut in connection with the clearing operations shall be cut so that the resulting stumps shall be no higher than six inches measured from the ground to the uphill side.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 4)

23. Where clearing operations involve the cutting of merchantable timber (as identified by DIAND), the operator shall notify the Agency of the amount, if any, which will be cut, removed, or destroyed in construction of the pipeline system and shall pay the Government of Canada the sum of money the Agency shall determined to be the value of the timber to be cut, removed, or destroyed with the exception of that timber removed by local communities.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

24. All merchantable timber shall be felled by hand.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

25. Local communities shall have first refusal for any stands of merchantable timber that they might eventually have used had there been no pipeline.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

26. Merchantable timber shall be cut and stacked. If not used within two years, such stacked timber shall be disposed of by burning.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

27. No log landing shall be located within three hundred feet of any watercourse.

RESPONSE:

It would not be possible to comply since watercourse is defined as "any identifiable trace made by concentrated runoff water on the earth surface". The recommendation should read:

ALTERNATIVE RECOMMENDATION:

27. No log landing shall be located within three hundred feet of any stream without prior approval of the Agency.

Pipeline and Facilities
Vegetation and Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

28. Logs shall not be skidded or yarded across any stream without the prior approval of the Agency.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

29. There will be complete disposal of all trees, snags, brush and other woody material resulting from clearing operation, by burning, with the exception of survey lines and winter trails where lopping and scattering will be sufficient. The use of chippers may be authorized by the Agency.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

30. The disposal of cleared woody material shall be concurrent with clearing except where there is summer clearing and burning would be hazardous. Disposal will then take place the following winter season.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 5)

31. The burning of slash, etc. shall be carried out on racks or sleds, designed for the purpose, or on rock surfaces, or any other such area where subsidence due to thawing will not occur. Burning shall be carried out under controlled conditions in winter when the fire hazard is negligible.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendation

RECOMMENDATION: (Page 5)

32. No burn area shall be located within 300 feet of a river, stream or lake.

RESPONSE:

If burning sleds are used this restriction should not apply. The recommendation should read:

ALTERNATIVE RECOMMENDATION:

32. No burn area shall be located within 300 feet of a river, stream or lake. If burning sleds are used the minimum distance shall be 100 feet.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATIONS: (Page 5)

33. All clearing debris that may block stream flow, hinder fish passage or contribute to flood damage as the result of stream bed scour or erosion shall be removed and disposed of by burning. Wood chips or tree bark shall not be permitted to enter and shall not be deposited in any waterbody.

RESPONSE:

Acceptable.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 6)

34. All residue from burning and all non-combustible waste shall be buried in spent borrow areas.

RESPONSE:

This is not practical if burning sleds are used. The recommendation should read:

ALTERNATIVE RECOMMENDATION:

34. All residue from burning and all non-combustible waste shall be buried in spent borrow areas or other acceptable areas approved by the Agency. If burning sleds are used this recommendation does not apply.

Pipeline and Facilities
Vegetation Clearing

Specific Recommendations

RECOMMENDATION: (Page 6)

35. Clean-up of all areas shall be carried out to the satisfaction of the Agency.

RESPONSE:

Acceptable.

Pipeline and Facilities
Snow Roads

General

RECOMMENDATION: (Page 4)

1. Construction of any part of the pipeline within the discontinuous and continuous permafrost region shall take place in winter from snow working surfaces and snow roads, except where some different logistic mode is approved by the Agency.

RESPONSE:

This recommendation should be expanded to cover conventional and arctic construction modes. It should read as follows:

ALTERNATIVE RECOMMENDATION:

1. Construction of any part of the pipeline within the discontinuous and continuous permafrost region on sensitive terrain shall take place in winter from snow working surfaces and snow roads, and the "arctic construction" mode of construction utilized, except where some different logistic mode is approved by the Agency. The "conventional winter" construction modes may be used in thaw-stable permafrost areas and in non-permafrost areas.

Pipeline and Facilities
Snow Roads

General

RECOMMENDATION: (Page 4)

2. Any pipeline approved for construction on any part of the Mackenzie Delta (the modern river delta) or on the Yukon Coastal Plain west of the delta shall be built only in winter from snow working surfaces and snow roads. That is, the construction mode shall not differ basically from that presently proposed by Arctic Gas and use of gravel pads and gravel roads shall not exceed the limited scale involved in the present Application. On no account shall a gravel work pad be built along the right-of-way or any gravel road be built along or to the pipeline route.

RESPONSE:

Acceptable.

Pipeline and Facilities
Snow Roads

General

RECOMMENDATION: (Page 5)

3. The use of the Fort Simpson-Inuvik winter road, if required in support of pipeline construction, shall be without major modification to routes or grades and without cuts, grading, widening or relocation. In its present form this winter road is not suitable for major pipeline transport.

RESPONSE:

This recommendation, if followed, would result in more terrain damage and disturbance than should be necessary since facilities parallel to the road would be required. It should read:

ALTERNATIVE RECOMMENDATION:

3. Wherever feasible the Fort Simpson-Inuvik winter road should be used in support of pipeline construction in lieu of constructing parallel access facilities. In sensitive permafrost terrain cuts, grading and fill modifications to the road are prohibited. In thaw-stable permafrost and stable non-permafrost areas grading of the existing road will be allowed.

Pipeline and Facilities
Snow Roads

Preliminary Design

RECOMMENDATION: (Page 5)

4. As part of its preliminary design submission, the Company shall provide convincing evidence that the required snow roads along the Yukon Coastal Plain are technically feasible and environmentally acceptable. As part of this demonstration, the Company shall conduct tests of snow harvesting using fences on the Yukon Coastal Plain for at least three consecutive years. Some aspects to be considered are: orientation of the fences; time and rate of snow accumulation; harvesting techniques that minimize surface disturbance; spacing; removal of fences prior to spring melt; and rehabilitation procedures. A demonstration of road building capability using snow manufacturing equipment shall also be included.

RESPONSE:

This would require three winters of testing before preliminary designs could be submitted. This recommendation should read:

ALTERNATIVE RECOMMENDATION:

4. As part of its final design submission, the Company shall provide convincing evidence that the required snow roads along the Yukon Coastal Plain are technically feasible and environmentally acceptable. As part of this demonstration, the Company shall conduct tests of snow harvesting using fences on the Yukon Coastal Plain. Some aspects to be considered are: orientation of the fences; time and rate of snow accumulation; harvesting techniques that minimize surface disturbance; spacing; removal of fences prior to spring melt; and rehabilitation procedures. A demonstration of road building capability using snow manufacturing equipment shall be performed at an acceptable location north of 60°.

Pipeline and Facilities
Snow Roads

Preliminary Design

RECOMMENDATION: Page 5 & 6)

5. Prior to the commencement of final design the Company shall submit for Agency approval a preliminary design for all snow work pads and winter trails required for the project documenting:
- (a) the locatin of all snow roads, snow work pads, winter trails and stream and river crossings (in map form) required for the project;
 - (b) a general Overall Plan for all water withdrawals required for snow road construction as specified in "Water Supply and Intakes";
 - (c) the design standards to be applied, including those for stream and river crossings, and the suitability of these for their specific purpose; maximum grades and limits on vertical and horizontal curvature shall be specified;
 - (d) the design rationale that was used in determining the design standard and location for each snow road type.

RESPONSE:

Acceptable.

Pipeline and Facilities
Snow Roads

Specific Design

RECOMMENDATION: (Page 6)

6. Snow road plans will be approved separately for each construction spread. The following information will be submitted to the Agency:
 - (a) the exact location of all snow roads, potential water sources and lakes to be used for snow harvest, shown on photo-mosaic maps (scale 1":1000'); and include access trails to water sources and snow harvest lakes as well as the probable location for snow harvest fences;
 - (b) the methods and equipment to be used for right-of-way preparation (including enhancement of frost penetration), snow harvesting and hauling, snow compaction and ice capping;
 - (c) the expected date when snow road construction can begin, the date the snow road is required for use, and the flexibility in this latter date;
 - (d) the nature, number and location of wet areas (including but not exclusively, rivers and streams) that must be crossed when constructing snow roads, the construction methods to be used to cross areas, and the required crossing date for each area;
 - (e) the dates when snow harvesting from lake surface is to begin and the amounts of snow to be harvested; this shall include information on equipment logistics, access routes to each lake and lake margin, and rehabilitation procedures, especially for damaged lake margins;
 - (f) the date and method of placement of snow fences, wildlife protection measures, snow harvesting techniques, the date and method of snow fence removal, and rehabilitation procedures, both for terrain damaged because of vehicle activity during harvesting and for erosion resulting from increased run-off;
 - (g) the access routes to all water sources required for snow road construction and equipment logistics, especially those for snow manufacturing equipment;
 - (h) the methods and equipment to be used for ice bridge construction, including the approaches;
 - (i) the methods and equipment to be used to maintain the snow roads;

- (j) the dates for the termination of use of each road at the end of the winter construction season, and the detailed procedures that the Company will apply to terminate their use; and
- (k) the abandonment procedures to be applied to snow roads when their use is terminated to ensure that river and stream crossings do not interfere with normal break-up and that overland drainage is not blocked or concentrated. Rehabilitation procedures shall also be specified.

RESPONSE:

All sub-items are acceptable, except (d) and (e). Item (d) requires further definition (wet areas unacceptable). Item (e) is a contingency plan and should be described as such. These two sub-items should read as follows:

ALTERNATIVE RECOMMENDATIONS:

6. (d) the nature, number and location of all streams, creeks, and rivers as defined in "Crossings:Definitions" that must be crossed when constructing snow roads, the construction methods to be used, and the required crossing date for each;
- (e) the dates when snow harvesting from lake surface might have to start under the contingency plan and the approximate amount of snow that might have to be harvested; this shall include information on equipment logistics, access routes to each lake and lake margin, and rehabilitation procedures, especially for damaged lake margins;

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 7)

7. Winter road preparation shall not begin before frost has penetrated at least 8 inches into the ground and 4 inches of snow has accumulated. However, the acceleration of frost penetration may be permitted by the Agency when there is 4 inches of natural frost penetration and 4 inches of snow cover. Equipment type and use must be approved by the Agency.

RESPONSE:

This recommendation should refer to snow roads, not winter roads, and should read as follows:

ALTERNATIVE RECOMMENDATION:

7. Snow road preparation shall not begin before frost has penetrated at least 8 inches into the ground and 4 inches of snow has accumulated, or as otherwise approved by the Agency. The acceleration of frost penetration may be permitted by the Agency when there is 4 inches of natural frost penetration. Equipment type and use must be approved by the Agency.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: Page 8)

8. An Agency approved temporary crossing structure is required for all crossings of unfrozen streams, either during the preparation of snow roads or during the construction of the pipeline. There will be no passage of vehicles through stream beds.

RESPONSE:

This recommendation requires a minor change in the last sentence and should read:

ALTERNATIVE RECOMMENDATION:

8. An Agency approved temporary crossing structure is required for all crossings of unfrozen streams during the preparation of snow roads

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

9. Equipment required for the manufacture of snow for road construction must be placed and used without causing terrain damage.

RESPONSE:

We could not comply with recommendation as written. It should read:

ALTERNATIVE RECOMMENDATION:

9. Equipment required for the manufacture of snow for road construction must be placed and used without causing or unacceptable terrain damage.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

10. Water use must be from an approved source (see "Water Supplies and Intakes").

RESPONSE:

Acceptable.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

11. Fences required for the collection of snow shall be placed in such a manner that they do not interfere with wildlife movements. Such fences will be removed by the completion of each construction season; no fences will remain in place across a summer season.

RESPONSE:

We could not comply with this recommendation as written. It should read:

ALTERNATIVE RECOMMENDATION:

11. Fences required for the collection of snow shall be placed in such a manner that they do not unduly restrict wildlife movements. Such fences will be removed by the completion of each construction season; no fences will remain in place across a summer season unless approval is obtained from the Agency.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

12. Access to lakes for the purpose of snow harvesting or to lakes or streams for water removal must be done in such a way that damage to margins and banks is limited. No cuts will be allowed and all fills must be made of snow or ice or both. Terrain damage must be repaired as soon as practicable (see also (Water Supplies and Intakes)).

RESPONSE:

Acceptable.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

13. Snow roads must have a compacted thickness of 10 inches and a density of 0.6 gms. per cubic centimeter or greater before full wheeled traffic will be allowed. In areas of hummocky terrain the compacted snow depth will be measured from the crest of the hummocks.

RESPONSE:

The minimum density should be 0.5 gms. per cubic centimeter. The recommendation should read:

ALTERNATIVE RECOMMENDATION:

13. Snow roads must have a compacted thickness of 10 inches and a density of 0.5 gms. per cubic centimeter or greater before full wheeled traffic will be allowed. In areas of hummocky terrain the compacted snow depth will be measured from the crest of the hummock.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

14. Stream crossings, other than temporary bridges, shall be made of snow or ice or both. No earth, timber, or brush shall form any part of such a crossing.

RESPONSE:

Acceptable.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

15. The snow roads will be maintained to prevent contact between vehicle wheels or tracks and the ground surface.

RESPONSE:

Acceptable.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 8)

16. The Company shall begin the termination of its winter construction activities on a week's notice and shall be prepared to cease all construction activity on 48 hours' notice.

RESPONSE:

This recommendation should refer to the condition of winter roads and read:

ALTERNATIVE RECOMMENDATION:

16. The Company shall begin the termination of its winter construction activities on a week's notice, having regard to the condition of the snow road, and shall be prepared to cease all construction activity on 48 hours' notice.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 9)

17. The Company shall remove all material, plant and equipment from the work area prior to abandonment of the winter road. Should such removal be impossible, the Company shall store such material, plant, and equipment in a location approved by the Agency. Such material, plant and equipment shall not be moved from such an area without the prior approval of the Agency.

RESPONSE:

Not acceptable.

ALTERNATIVE RECOMMENDATION:

17. The Company shall remove all material, plant and equipment from the work area serviced only by a snow road prior to the abandonment of the snow road, unless otherwise approved by the Agency. The Company shall store material, plant and equipment in a location approved by the Agency. Unless the area is serviced by a permanent road such material, plant and equipment shall not be moved without the prior approval of the Agency.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 9)

18. All crossings of minor streams and rivers shall be removed prior to break-up.

RESPONSE:

This recommendation is too restrictive and should read:

ALTERNATIVE RECOMMENDATION:

18. All crossings of minor streams and rivers shall be removed sufficient to allow flow without damage prior to break-up.

Pipeline and Facilities
Snow Roads

Performance Criteria

RECOMMENDATION: (Page 9)

19. The snow road will be cross-ditched in areas where the concentration or diversion of overland flow in spring could result in erosion.

RESPONSES:

Acceptable.

Pipeline and Facilities
Snow Roads

Performance Criteria

20. Terrain damaged during the construction, operation and abandonment of the snow road will be repaired the following summer.

RESPONSE:

Acceptable.

Pipeline and Facilities
Geotechnical Considerations

General Recommendations

RECOMMENDATION: (Page 2)

1. A geotechnical review board consisting preferably of three experts, should be appointed by the Agency and should be charged with review of all engineering works, detailed design, construction procedures, field organization, and monitoring methods involving matters lacking precedent and experience. Emphases in qualification of experts comprising the board should be depth of experience and overlapping broad background. The board should include:
 - a) an engineer familiar with cold region geotechnical and hydrological problems relevant to design and construction of the proposed pipeline;
 - b) an earth scientist familiar with surface and subsurface conditions along the pipeline route and their geotechnical implications; and
 - c) A gas transmission engineer with extensive background in design, construction, and pipeline contract administration.

RESPONSE:

CAGSL agrees that there should be some mechanism whereby there would be a review of all engineering works, detailed design, construction procedures, field organization, and monitoring methods involving frost heave, thaw settlement and slope stability. This could be accomplished with a small board appointed by and reporting to the Agency.

Such a small board of experts has the major advantage of placing the responsibility for design entirely upon the design engineers where it clearly belongs. The board would not adopt design responsibility, a procedure which has rendered similar boards ineffective, but must satisfy themselves that design concepts and procedures are satisfactory and

compatible with ground conditions. The proposed structure of the board is an advantage in that it reflects the integrated design approach adopted by CAGSL.

It is obvious that in order for the board to function effectively with the design group, the Company must have direct input into the terms of reference and selection of the board. The terms of reference must be set out in such a way that the board can fulfill its responsibility in a timely manner.

The scope of the review board as set out is "review of all engineering works, detailed design, construction procedures, field organization, and monitoring methods involving matters lacking precedent and experience". Since the chilled gas line in itself lacks precedent, CAGSL is concerned that the review board could be burdened with design aspects which, although related to a unique pipeline lacking precedent and experience, are in fact either logical extensions of conventional practice or are not unique insofar as the particular application is concerned. For example, buoyancy control in wetlands and at water crossings is a matter of conventional practice. The only aspect of buoyancy control not related to conventional practice is ice-rich permafrost. The design for this condition is straightforward and areas requiring control will be identified in the field. The review board should therefore not concern itself with buoyancy control. Drainage and erosion control measures are extensions of proven techniques to permafrost areas. The technology is not without precedent and should therefore not be a concern of the geotechnical

review board. The same can be said about pile foundations in permafrost and technology related to river regime. CAGSL's position is that the geotechnical review board should deal with the major issues related to geotechnical matters lacking precedent and experience. These are: frost heave, thaw settlement and slope stability.

ALTERNATIVE RECOMMENDATION:

1. A geotechnical review mechanism which could be a review board consisting preferably of three experts appointed by and reporting to the Agency developed in consultation with the Company should be charged with review of all engineering works, detailed design, construction procedures, field organization, and monitoring methods involving frost heave, thaw settlement, and slope stability. The review work must be carried out in a timely manner. Emphases in qualification of experts comprising the board should be depth of experience and overlapping broad background. The board should include:
 - a) an engineering familiar with cold region geotechnical and hydrological problems relevant to design and construction of the proposed pipeline;
 - b) an earth scientist familiar with surface and subsurface conditions along the pipeline route and their geotechnical implications; and
 - c) a gas transmission engineer with extensive background in design, construction, and pipeline contract administration.

Pipeline and Facilities
Geotechnical Considerations

General Recommendations

RECOMMENDATION: (Page 3)

2. In view of the lack of precedent and limited knowledge of actual field conditions relative to various geotechnical aspects of the pipeline project, the approach to design, construction methods and control should be more conservative than is usual in normal pipeline engineering practice. In particular, the Company should adopt (and be required to so demonstrate) contingency planning throughout.

RESPONSE:

CAGSL agrees with the conservative design approach philosophy contained in the recommendation and has taken that approach in all preliminary design work completed to date. The final sentence relating to contingency planning throughout requires clarification. CAGSL's position is that contingency planning consisting of remedial measures to be adopted, if required, be established to the satisfaction of the Agency. Contingency planning is not required throughout. It is required for situations which may affect structural integrity of the pipeline or environment, resulting from frost heave, thaw settlement, slope stability or erosion.

ALTERNATIVE RECOMMENDATION:

2. In view of the lack of precedent and limited knowledge of actual field conditions relative to various geotechnical aspects of the pipeline project, the approach to design, construction methods and control should be more conservative than is usual in normal pipeline engineering practice. In particular, the Company should

develop remedial measures for problems which may adversely affect the structural integrity of the pipeline or the environment as a result of slope stability, frost heave, thaw settlement or erosion.

Pipeline and Facilities
Geotechnical Considerations

General Recommendations

RECOMMENDATION: (Page 3)

3. In situations where important engineering decisions have to be reached using empirical formulas based upon laboratory tests or interpretation of poorly known site conditions, without the benefit of past experience with similar field prototypes, the Company shall demonstrate the sensitivity to error of the basis of such decisions. Where the basis for a decision is error-sensitive, its reliability should be thoroughly established through cross-checking.

RESPONSE:

Acceptable.

Pipeline and Facilities
Geotechnical Considerations

General Recommendations:

RECOMMENDATION: (Page 4)

4. Although every effort should be made to obtain as much data on surface and subsurface conditions as is practicable prior to construction, it is inevitable with a pipeline of such length and because of the remoteness of the area that much important design change information will be revealed during construction. This being the case, the design phase should be considered as running into and parallel with construction, to be terminated only at the end of construction. The Company should establish workable and fruitful liaison between those responsible for design and those responsible for construction. It should be required to demonstrate that the design concept with all its engineering and environmental implications is in fact being carried through into construction.

RESPONSE:

Acceptable.

Pipeline and Facilities
Geotechnical Considerations

General Recommendations:

RECOMMENDATION: (Page 4)

5. The project obviously will need a well selected and organised field team for inspection and construction control. Bearing in mind the considerable number of people required on this team and the seasonal nature of the construction schedule, there will be very real problems in obtaining and keeping qualified personnel. The need to develop on the one hand a reliable system of checking the work to be carried out by this team, and on the other hand to render their work as error-proof as possible by conservative design, is readily apparent. The Company plans in this regard should be reviewed by the geotechnical review board.

It will be necessary to establish an educational program to ensure that all field personnel fully appreciate the importance and significance of the observations they are required to make.

Further it is essential, bearing in mind the proposed rapid pace of construction, that an appropriate and reliable means of expediting desirable design changes be established. It is expected that this would be done through a field design staff without recourse to a distant design office, except for major design changes.

RESPONSE:

Acceptable.

Pipeline and Facilities
Geotechnical Considerations

General Recommendations:

RECOMMENDATION: (Page 4)

6. Prior to final design, the Company should adjust its route and locations so as to minimize the length of the pipeline that crosses terrain which is potentially troublesome in terms of frost heave, thaw settlement, slope stability, buoyancy control, and erosion.

RESPONSE:

Not acceptable. The recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

6. Prior to the final design the Company should adjust its route and locations so as to optimize the route considering frost heave, thaw settlement, slope stability, buoyancy control and erosion.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 6)

1. In view of the uncertainties and concerns about frost heave and its control that have been described in this section, it is recommended that all design and construction procedures relating to frost heave and any changes thereto be independently reviewed by the geotechnical review board proposed in the foregoing section, and that for this purpose the board be supplemented by a physicist thoroughly versed in the processes by which soil freezes. Moreover, approval of final design by the Agency should be conditioned upon a favourable report by the board concerning frost heave control.

RESPONSE:

Unacceptable.

The Geotechnical Review Board already has two geotechnical members on it that must have some familiarity with frost heave in order to qualify for their selection. Presumably, they will already have the freedom to obtain specialized technical advice, if they require it, for any of the specialized areas such as slope stability or thaw settlement so no purpose is served by expanding the Board by one with a physicist to approve frost heave designs. In addition, the very existence of the Board implies that they must give general approval for all designs prior to approval by the Agency so again no purpose is served by stipulating that frost heave control must have a favourable report from the Board.

This recommendation does not give the Geotechnical Review Board any

Pipeline and Facilities
Frost Heave

more authority or scope than it previously had. The result is that the workings of the Board will be more complicated when dealing with frost heave with no clear advantage to the Agency or CAGSL.

RECOMMENDED ALTERNATIVE:

1. Delete this recommendation.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 5)

2. Unprecedented issues are involved in the geotechnical aspects of the engineering and construction of the pipeline. As such the detailed experience gained by NES and its consultants is unusually valuable both in itself and as a base for further necessary investigations and studies. It is in the interests of everyone that those ultimately responsible for building the pipeline should make a bona fide effort to utilize these experienced personnel. Notwithstanding this recommendation, the Inquiry has shown first hand the merits of inter-mixing the "fresh blood".

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 7)

3. The pipeline engineers should adopt a cautious approach to ensure a suitably conservative design. The design and construction contract arrangements should be flexible to permit substantial changes as understanding of the field conditions and related problems improves.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 7)

4. The Calgary full scale field tests should be continued until they demonstrate conclusively that over the long term the various preventative and remedial measures used at the test site can reduce pipe heave to acceptable and predictable amounts.

RESPONSE:

Unacceptable.

This recommendation is too open ended. It doesn't give CAGSL the opportunity to close down the facility if they determine that little additional useful information for design is being obtained.

The Calgary full scale field tests were designed to obtain information on the effect of overburden pressure on the rate of heave and data on the amount of heave taking place within the frozen soil in the frost bulbs around each buried test section at prototype scale. A substantial amount of the useful information has already been obtained because the test facility has been in operation for over 2-1/2 years.

RECOMMENDED ALTERNATIVE:

4. The Calgary full scale field tests should be continued as long as useful information for CAGSL's designs is being obtained.

Pipeline and Facilities
Frost Heave

RECOMMENDATION:

5. The data obtained from the Calgary test site should be reviewed on an ongoing basis and the design methods refined accordingly.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 7)

6. It is recommended that other preventative and remedial measures, such as items (d) and (h) in the list at the beginning of this section, be given thorough technical and economic consideration. The alternative of elevating the pipe above ground when heaving cannot be readily controlled should also be included.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 7)

7. Appropriate additional laboratory tests should be conducted to assess the significance of frost lens growth behind the frost front.

RESPONSE:

Unacceptable.

There is no requirement to undertake laboratory tests to assess the significance of frost lens growth behind the frost front, i.e., rate of frost heave in previously frozen ground. This has been assessed at the Calgary Test Site and the conclusion was stated on page 26, Response to Dr. P.J. Williams' Report on Possible Heave of Chilled Gas Pipeline, June 1976, NES, that "no heave of engineering significance was observed to occur in frozen ground at the Calgary Test Facility where test sections of pipeline were operated under prototype conditions". The data that supported this conclusion was given on pages 36 and 37 of the previously mentioned report.

RECOMMENDED ALTERNATIVE:

7. Delete this recommendation.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 8)

8. In the light of the announcement by Arctic Gas on October 7, 1976 that the laboratory tests for shut-off pressure are faulty, it is further recommended that additional laboratory tests be carried out to correct the effect of the erroneous tests and re-evaluate the empirical equations as they affect the feasibility of berming and burials as a form of heave control.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATIONS: (Page 8)

9. It is necessary to complete the field drilling program and the geophysical profiling prior to completion of detailed design. It is further recommended that micro-scale (detailed) subsurface investigations be carried out at typical locations where severe differential heave is anticipated.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 8)

10. The performance of the pipe should be monitored on a routine basis in accordance with an established schedule. This schedule should allow for frequent inspections (see following paragraphs on "Monitoring of Frost Heave After Construction") during the first year of operation. The frequency of monitoring could be reduced thereafter, depending on the observed behavior.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 10)

11. The completion of detailed exploration (drilling and terrain analysis) of that portion of the pipeline route between MP 670 and 870 needs emphasis. Those areas where significant thaw settlement and significant frost heave could occur should be reliably identified.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 10)

12. Measures for reducing the impact of thaw settlement, associated drainage problems, and resulting environmental damage need to be critically studied in detail. Where necessary, supporting field tests should be carried out.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 10 & 11)

13. Based on the above, a tentative location for the limit of chilling should be conservatively selected from the standpoint of detailed design and fabrication of equipment. This is a location south of which the need for cooling equipment is considered remote, using a pessimistic interpretation of thaw settlement problems.
14. The final decision of the location of the limit of chilling should be postponed until construction, when additional detailed soils data will become available.
15. The design of the cooling equipment should be such that the location of the southern limit of gas cooled below 0°C can be modified depending upon the observed behaviour of the pipeline under operation.

RESPONSE:

Unacceptable.

In summary, these recommendations say that the location of the last point of cold flow should be located as far south as it would ever need to be, being pessimistic about thaw settlement problems, and then having enough flexibility in the equipment at the compressor stations to move the last point of cold flow north if operating the pipeline proved difficult. In addition to the extra equipment required, the pipeline in this area would have to be designed for both frost heave and thaw settlement.

RECOMMENDED ALTERNATIVE:

The Company, prior to final design, should determine the location of

Pipeline and Facilities
Frost Heave

the last point of cold flow and design for freezing pipe conditions
north of that point and thawing pipe conditions south of it.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: Page 12)

16. The Company should demonstrate well in advance of construction how it proposes to cope with the problem (peculiar to this project) of selecting, organizing and administering construction control and inspection personnel.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

Confirmation of Design Assumptions During Construction

RECOMMENDATION: (Page 13)

17. It is recommended that independent review by the proposed geotechnical review board of the field organization for engineering supervision and construction control be undertaken as construction proceeds. This is to ensure that there is a satisfactory mechanism of promptly identifying problem areas and implementing design changes.

RESPONSES:

Not acceptable. CAGSL believes that the review board should be reporting to the Agency and therefore the recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

17. It is recommended that review by the proposed geotechnical review board of the field organization for engineering supervision and construction control be undertaken as construction proceeds. This is to ensure that there is a satisfactory mechanism of promptly identifying problem areas and implementing design changes.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 13)

18. Because of the concerns expressed above it is recommended that pre-construction investigation of the soil conditions along the route should be sufficiently detailed to permit reliable design and minimize reliance upon design changes (item 7). The designers should look to the inspector's logging during construction as a check on previous exploration of soil conditions, not an extension of that exploration.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

RECOMMENDATION: (Page 14)

19. It is recommended that a detailed study of the feasibility of alternative methods and procedures of monitoring the performance of the pipeline be carried out. In particular, the use of an instrumented "smart" pig, which can detect changes in pipe curvature at frequent intervals, appears to be a promising alternative. It is recommended that feasibility studies of the effectiveness of such an instrument for a natural gas pipeline be given high priority.

RESPONSE:

Acceptable.

Pipeline and Facilities
Frost Heave

Monitoring of Frost Heave After Construction

RECOMMENDATION: (Page 14)

20. In view of the unprecedented nature and the importance of the monitoring program it is recommended that both the intended procedure and the results of the program be independently reviewed by the proposed geotechnical review board.

RESPONSE:

Not acceptable. The word "independently" should be removed from the recommendation and should read as follows:

ALTERNATIVE RECOMMENDATION:

20. In view of the unprecedented nature and the important of the monitoring program it is recommended that both the intended procedure and the results of the program be reviewed by the proposed geotechnical review board.

Pipeline and Facilities
Pipe Uplift Problems

RECOMMENDATION: (Page 4)

1. The Company should undertake detailed drilling and route investigation to identify the location of those areas requiring design of uplift control measures, and to determine the most suitable design.

RESPONSE:

Unacceptable.

The term "detailed drilling" implies that a requirement exists to undertake a very extensive drilling program along the pipeline route in order to determine where uplift control measures are needed and such is not the case. These locations can be easily located with a limited amount of drilling combined with surficial route investigation and making use of the information developed from detailed terrain analysis. The expected ground conditions can be quickly verified once the ditch is opened.

RECOMMENDED ALTERNATIVE:

1. The Company should undertake sufficient drilling, route investigation and terrain analysis to adequately identify the location of those areas requiring design of uplift control measures, and to determine the most suitable design.

Pipeline and Facilities
Pipe Uplift Problems

Design of Control Measures

RECOMMENDATION: (Page 4)

2. Uplift due to buoyancy is an important factor to be taken into account in selecting the southern limit of chilling.

RESPONSE:

Acceptable.

Pipeline and Facilities
Pipe Uplift Problems

Design of Control Measures

RECOMMENDATION: (Page 4)

3. Greater emphasis should be placed on the depth of pipe burial in areas subject to uplift by buoyancy. The cost-benefit approach initiated by Arctic Gas (NES, 1974a) should be expanded to allow for the costs of design uncertainties, possible affects on schedules, maintenance costs etc..

RESPONSE:

Acceptable.

Pipeline and Facilities
Pipe Uplift Problems

RECOMMENDATION: (Page 4)

4. A conservative procedure should be maintained throughout. The most appropriate approach in design of buoyancy controls and pipe bends is to use a suitably high factor of safety.

RESPONSE:

Accept intent, but not wording.

RECOMMENDED ALTERNATIVE:

4. A conservative procedure should be maintained throughout. The most appropriate approach in design of buoyancy controls and pipe bends is to use a suitable factor of safety.

Pipeline and Facilities
Pipe Uplift Problems

Design Modification During Construction

5. Since it is highly desirable to limit the possibilities of pipe uplift, the Company should examine the difficulties associated with the field checking and inspection from the standpoint of buoyancy control and should demonstrate how it intends to overcome these difficulties; such plans should be prepared and submitted to the Agency at final design. There is a need, for example, to establish local guidelines to assist the inspectors in recognising and evaluating under winter conditions, site facts which are conducive to pipe uplift.

RESPONSE:

Acceptable.

Pipeline and Facilities
Pipe Uplift Problems

Design Modification During Construction

RECOMMENDATION: (Page 6)

6. It is recommended that independent review by the proposed geotechnical review board of the field organization for engineering supervision and construction control be undertaken as construction proceeds. This is to ensure that there is a satisfactory mechanism of promptly identifying problem areas and implementing design changes.

RESPONSE:

Not Acceptable. See Response to "Geotechnical Considerstions - Recommendation No. 1". The above recommendation should be deleted.

Pipeline and Facilities
Pipe Uplift Problems

RECOMMENDATION: (Page 6)

7. Because of the concerns expressed above it is recommended that pre-construction investigation of the soil conditions along the route should be sufficiently detailed to permit reliable design and minimize reliance upon design changes. The designers should look to the inspector's logging during construction as a check on previous exploration of soil conditions, not an extension of that exploration.

RESPONSE:

Unacceptable.

The proposition to undertake sufficiently detailed pre-construction investigation of the soil conditions along the route to permit reliable design and minimize reliance upon design changes is generally acceptable. What is not acceptable is the suggestion that the detailed information available in the open trench and the spoil mound (the potential backfill) shall not be regarded as an extension to the pre-construction exploration. Since the design of uplift control measures depends on the soil conditions adjacent to and above the pipe, it is inappropriate to minimize reliance on that critical information.

RECOMMENDED ALTERNATIVE:

7. Delete this recommendation.

Pipe and Facilities
Pipe Uplift Problems

RECOMMENDATION: (Page 7)

8. In view of the unprecedented nature and the importance of the monitoring program it is recommended that both the intended procedure and the results of the program be independently reviewed by the proposed geotechnical review board.

RESPONSE:

Acceptable.

Pipeline and Facilities
Pipe Uplift Problems

Monitoring and Remedial Measures

RECOMMENDATION: (Page 7)

9. The Company should conduct a detailed study of the potential problems resulting from an uplifted or floating pipe, the feasibility of various remedial measures, and the impact of these measures.

RESPONSE:

Acceptable.

Pipeline and Facilities
Pipe Uplift Problems

RECOMMENDATION: (Page 8)

10. The possibility of pipe flotation after abandonment should be investigated and provided for in the Company's design.

RESPONSE:

Acceptable.

Pipeline and Facilities
Pipe Uplift Problems

RECOMMENDATION: (Page 8)

11. An agreement is required on who will be responsible for any necessary remedial actions after abandonment and how these actions will be funded.

RESPONSE:

Acceptable.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 4)

1. In selecting the route alignment and any necessary changes thereto the Company should be conscious of avoiding to the maximum extent practicable areas of questionable slope stability. The Applicant should be required to demonstrate that he has undertaken field surveys of the route in sufficient detail to ensure that all significantly unstable areas along and adjacent to the route have been detected prior to commencing construction.

RESPONSE:

Acceptable.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 4)

2. The Company should undertake detailed field investigation and study of a number of flow slides selected to consider the effect of variation in topography, slide geometry, soil type and cause. The purpose of this work is to clarify and extend understanding of flow slide mechanisms in relation to the installation and maintenance of the proposed pipeline.

RESPONSE:

Acceptable.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 4)

3. It is recommended that all feasible preventive and remedial measures be given thorough technical and economic consideration.

RESPONSE:

Acceptable.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 4)

4. Notwithstanding Recommendation 1, it is unlikely, should the pipeline proceed according to schedule, that the level of confidence in predicting and analyzing flow slides attained by the start of construction will eliminate the concern expressed in this section. The work covered under Recommendation 1 will however, serve to mitigate some of the concerns.

The Company should therefore develop a plan for reliably detecting the occurrence of flow slides and the threat of bi-model flows along and adjacent to the pipeling right-of-way. Monitoring should be carried out by geologists or geotechnical engineers experienced in the investigation and assessment of slope stability hazards in permafrost terrain. To ensure the prompt construction of suitable stability measures, it is expected that this will involve stockpiling of materials along the route.

Stabilization should be carried out with a minimum of disturbance in a failure area as such an area is likely prone to further failures if the natural cover is disturbed. This clearly requires that carefully planned procedures be devised or the cost of stabilizing one location may be the initiation of another or several other flow slides. It also follows that particular care and refined construction techniques should be used during initial construction through known flow slide areas.

RESPONSE:

Unacceptable.

Stockpiling of materials along the route at all sites where the "potential" for skinflow slides or bi-model flows exist along, and adjacent to, the right-of-way, would unduly burden the Company and adversely affect the environment. Flow slides, restricted to the active layer will not affect the integrity of the line. Subsequent erosion or the development of bi-model flows is of major concern. Erosion can be controlled on an interim basis by methods not requiring material stockpiles until repairs can be carried out at the appropriate time of

year. For repairs to be carried out in the summer, the methods include insulation or reinforcement of the organic mat by hand labour with relatively little material, transportable by helicopter.

RECOMMENDED ALTERNATIVE

4. Notwithstanding Recommendation 1, it is unlikely, should the pipeline proceed according to schedule, that the level of confidence in predicting and analyzing flow slides attained by the start of construction will eliminate the concern expressed in this section. The work covered under Recommendation 1 will however, serve to mitigate some of the concerns.

The Company should therefore develop a plan for reliably detecting the occurrence of flow slides and the threat of bi-model flows along and adjacent to, the pipeline right-of-way. Monitoring should be carried out by geologists or geotechnical engineers experienced in the investigation and assessment of slope stability hazards in permafrost terrain. To ensure that the integrity of the pipeline is not affected by detrimental erosion or initiation of larger slides, the Company should be capable of controlling erosion until repairs can be undertaken in the winter months.

Stabilization should be carried out with a minimum of disturbance in a failure area as such an area is likely prone to further failures if the natural cover is disturbed. This clearly requires that

carefully planned procedures be devised or the cost of stabilizing one location may be the initiation of another or several other flow slides. It also follows that particular care and refined construction techniques should be used during initial construction through known flow slide areas.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 5)

5. In view of the concerns expressed above any stabilising measures should be conservatively designed to eliminate the need for any further remedial action in the area.

RESPONSE:

Acceptable.

RECOMMENDATION: (Page 6)

6. The Company should investigate and analyze in detail every slope along the right-of-way which possesses a potential for deep-seated instability. Such slopes should be selected for analysis so as to ensure that no critical areas have been overlooked.

RESPONSE:

Unacceptable. CAGSL agrees with the intent but not the wording.

RECOMMENDED ALTERNATIVE

6. The Company should investigate every slope along the right-of-way which possesses a potential for deep seated instability. Where the investigation indicates a potential problem, the slopes should be investigated and analyzed in detail to determine if stabilization or relocation is required.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 6)

7. Because of the lack of detailed knowledge of slides involving frozen material, geotechnical investigations undertaken to assess the stability of the higher slopes along the route should be more intensive than is normally considered adequate for similar situations in non-permafrost areas.

RESPONSE:

Acceptable.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 7)

8. Because of the lack of precedent in analyzing steep high slopes involving frozen materials, any protective or remedial measures such as berming should be more conservatively designed than is normal for non-permafrost areas.

RESPONSE:

Unacceptable. CAGSL agrees with the intent but not the wording.

RECOMMENDED ALTERNATIVE:

8. Because of the lack of precedent in analyzing steep high slopes involving frozen materials, any protective or remedial measures such as berming should be designed to account for the creep characteristics and frozen soil strength properties with an appropriate factor of safety.

RECOMMENDATION: (Page 7)

9. A detailed annual inspection of all pertinent slopes must be included in the post-construction monitoring program. The Company should make liberal use of proven types of slope instrumentation to assist monitoring.

RESPONSE:

Unacceptable

RECOMMENDED ALTERNATIVE:

9. A detailed annual inspection of all pertinent slopes must be included in the post-construction monitoring program. The Company should use proven types of slope instrumentation to assist monitoring where appropriate.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 7)

10. The Company should design and test the feasibility of methods for relieving subsurface water pressures on the uphill side of the frost bulb.

RESPONSE:

Unacceptable

The potential for subsurface water pressures on the uphill side of the frost bulb is very limited. Methods used for many years, for example on the Alaska Highway, are adequate.

RECOMMENDED ALTERNATIVE

10. The Company should make use of existing methods for relieving subsurface water pressures on the uphill side of the frost bulb.

Pipeline and Facilities
Slope Stability

Effect of Interference of Subsurface Drainage

RECOMMENDATION: (Page 7)

11. During construction, geotechnical field personnel should be made aware of this potential hazard. Observations of significant subsurface seepage should be reported and protective measures implemented as required.

RESPONSE:

Acceptable.

Pipeline and Facilities
Slope Stability

Creep of Ice Rich Slopes

RECOMMENDATION: (Page 9)

12. Arctic Gas indicates that further study into the phenomenon of creep of ice rich slopes is presently underway. It is recommended that this work continue to the point where sufficient information is obtained to enable a confident engineering prediction to be made as to which slopes have a potential for significant creep movements.

RESPONSE:

Acceptable.

Pipeline and Facilities
Slope Stability

RECOMMENDATION: (Page 9)

13. The Company should instrument slopes which appear to have a potential for creep movement, so that movements will be detected at an early stage. The development and use of an instrumented "smart" pig would also be a valuable supplement.

RESPONSE:

Acceptable

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 9)

1. The Company's drainage and erosion control designs, site plans and construction plans, shall be subject to approval by the Agency, both at the final design stage and just prior to installation. The installations shall be subject to inspection and approval by the Agency prior to the spring thaw period following their construction and at subsequent times. The following recommendations are for guidance of both the Company and the Agency.

RESPONSE:

Arctic Gas agrees that drainage and erosion control designs should be subject to approval by the Agency at the final design stage. However, once having been approved at this stage it is considered unacceptable that such plans might be disallowed just immediately prior to installation. It should also be noted that it is in Arctic Gas' interest to ensure that the pipeline is constructed in accordance with the designs prepared and this policy has been so stated in testimony several times.

RECOMMENDED ALTERNATIVE

1. The Company's drainage and erosion control designs, site plans and construction plans shall be subject to approval by the Agency at the final design stage. The installations shall be subject to inspection by the Agency prior to the spring thaw period following their construction and annually until such time as the pipeline is commissioned, at which time monitoring of such structures becomes a function of the appropriate government body.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 9)

2. Separate approaches are required for drainage and erosion control along the pipeline right-of-way and at all other sites including pads, roads, airfields, etc.

RESPONSE:

Acceptable

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 9)

3. Site-specific drainage and erosion control plans shall react to local, site-specific environmental or land-use concerns and not only to estimates of erosion probability or potential drainage disruption. For example: where erosion from any land proposed for use by the project has a potential for direct damage to fish or aquatic wildlife, devices for catchment, settlement, and/or diversion shall be provided and sites shall be adjusted, where appropriate, to permit catchment between the slope and any waterbody or wetland.

RESPONSES:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 9)

4. Potential for erosion and hence need for control measures can be reduced by selection of sites with minimum slope and by minimizing disturbance of the ground surface during clearing and construction: these measures are particularly important in areas of sensitive permafrost and fine grained soils. These approaches shall be reflected in final design locations and in final construction plans.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 9)

5. Drainage and erosion control structures are intended to complement the stabilizing effect of revegetation: nonetheless, they must be designed so as to achieve the required control unaided by vegetation. The structures shall be kept in repair and cleared out until their function has been completely taken over by new vegetation.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 9)

6. Structures which fail repeatedly or which present excessive and continual maintenance problems shall be redesigned and reconstructed so as to be both effective and more stable.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 10)

7. Erosion control structures shall be emplaced prior to the first spring following commencement of construction, whether construction has been completed or not. At sensitive sloping sites, clearing is considered to be part of construction in this context.

RESPONSE:

Unacceptable.

Erosion must be prevented at all times during and after construction and therefore placement of erosion control measures must be timed to ensure that the level of protection remains adequate at all times. This may well require placement of some measures in some sensitive areas following clearing operations or before construction is completed, but placing all measures before they are required could result in unnecessary cost and unnecessary environmental disturbance.

RECOMMENDED ALTERNATIVE

Placement of erosion control structures shall be staged to ensure that the protection against erosion is adequate at all times.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 10)

8. Any failures in any structures or devices shall be promptly repaired and damaged lands shall be restored as near as possible to the original condition.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 10)

9. Drainage and erosion control devices shall be designed and constructed in a manner that will facilitate travel along the pipeline right-of-way and without the devices being rendered ineffective by the passage of vehicles.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 10)

10. Any chemical or petroleum based sealants, sprays or soil stabilizers proposed for use shall be tested for toxicity and potential for pollution. Specific approval shall be obtained for each material proposed to be used.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 10)

11. All drainage ways and control structures shall be designed and maintained in a manner that will accommodate or allow for changes in ground level along the pipeline right-of-way, caused by frost heave, the growth of the frost bulb or thawing of the ground and surface subsidence.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 10)

12. Allowance shall be made in the design and maintenance of drainage controls for disruption of drainage patterns due to the growth of stream icings and surface icings alongside the right-of-way.

RESPONSE:

Acceptable.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION (Page 10)

13. Drainage breaks shall be provided into the backfill mound, surcharge berm or gravel work pad at all watercourse crossings, at all places where ephemeral flows of surface water cross the pipeline, and at frequent intervals in between to allow for the overland flow of spring melt or summer storm run-off. The spacing of such breaks shall be determined by a rational approach based on the concept of the "standard project-flood" described in "Crossings: Design Flows and Levels".

RESPONSE:

According to the definition of watercourse as given at Pipeline and Facilities, Crossings: Definitions (page 3), berm breaks etc. would be required at every point where there is a trace of running water. This is clearly not practicable. Arctic Gas has adopted as a principal criterion the provision of berm breaks to:

- (1) Maintain all identifiable natural cross drainage systems and
- (2) Minimize erosion by flow directed along the backfill mound.

A rational system to achieve this criterion has been fully described in the NESCL (1976) report "Drainage and Erosion Control Pilot Design Project" filed with the Commission on or about 13 October 1976. The general approach was earlier identified and outlined in the original application of March 1974 and has been testified to by Drs. Clark and Harlan during phases 1 and 2 of the Inquiry.

The concept of the "Standard Project Flood" has been addressed elsewhere. We would point out here that the "Standard Project Flood" is no guarantee of minimum environmental impact and it should not, therefore, be the basis

Pipeline and Facilities
Drainage and Erosion Control

for the design of erosion control measures.

RECOMMENDED ALTERNATIVE

13. Drainage breaks shall be provided in the backfill mound, surcharge berm, or gravel workpad at first order stream¹ crossings and at intervals in between sufficient to direct potentially erosive overland flow across the right-of-way. This closely corresponds to the minimum drainage course identifiable on an aerial photograph at a scale of 1"=2000'.

¹A first order stream is a small unbranched tributary.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 10)

14. In the selection, design and construction of drainage and erosion control devices on the right-of-way, the following objectives shall be pre-eminant:
- a) Surface and shallow subsurface drainage shall not be disturbed to the extent that water is ponded on or at the ground surface on or adjacent to the pipeline right-of-way.
 - b) There shall be no channelizing of overland flow or other concentrated drainage which could lead to mechanical or thermal erosion. In the case of ditches in right-of-way cuts, the ditch floors shall be protected from erosion by ditch checks, non-erosive blankets of clay or gravel, synthetic fabric mats or any other method acceptable to the Agency.
 - c) Water draining through mound breaks shall be dispersed over the ground surface on the down-slope side of the pipeline.
 - d) Sediments, particularly silt particles, entrained in flowing water shall be prevented from reaching any waterbodies or from being deposited on land except in designated areas. Sufficient stilling ponds, settling basins, sediment traps or other devices shall be installed to ensure this.
 - e) Particular attention shall be paid to the prevention of erosion on the banks of rivers and streams, on all cutslopes, in right-of-way cuts and on all valley side slopes. Site-specific designs shall be provided for such areas.

RESPONSE:

To prevent all ponding on or adjacent to the right-of-way, no matter how temporary, is clearly impossible and therefore unacceptable to Arctic Gas. It is also impossible to eliminate thermal erosion. Similarly, Recommendation 14 (d) is an impossible and therefore, unreasonable stipulation in that silt particles are transported by flowing water and deposited on land as a natural phenomenon. Surely the intent of the recommendation is to prevent excessive erosion and subsequent siltation.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDED ALTERNATIVE

In the selection, design and construction of drainage and erosion control devices on the right-of-way, the following objectives shall be pre-eminent:

- a) There shall be no channelizing of overland flow or other concentrated drainage which could lead to mechanical erosion. In the case of ditches in right-of-way cuts, the ditch floors shall be protected from erosion by ditch checks, non-erosive blankets of clay or gravel, synthetic fabric mats or any other method acceptable to the Agency.
- b) Water draining through mound breaks shall be dispersed over the ground surface on the downslope side of the pipeline.
- c) Particular attention shall be paid to the prevention of erosion on the banks of rivers and streams, on all cut slopes and right-of-way cuts and on all valley side slopes. Site specific designs shall be provided for such areas.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 11)

15. Separate plans and proposals shall be presented for drainage and erosion control on the pipeline right-of-way for areas of differing construction modes. The following categories are suggested:
- a) Areas of "arctic pipeline construction" where the pipeline is built from a snow road along the right-of-way.
 - b) Areas of "conventional winter construction", where the pipeline is built from a graded winter road.
 - c) Areas where a surcharge berm is built to control frost heave.
 - d) Areas subject to inundation by storm surges, ice-jams or other floods.
 - e) Areas of summer or fall construction, where the pipeline is built from a gravel work pad.

RESPONSE

Acceptable

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 12)

16. Special plans and proposals shall be presented for the design and installation of erosion control measures at all designated stream crossings. In particular special plans will be required at all major river crossings proposed to be constructed in summer. Draft plans are to be presented as part of the preliminary design submission for all designated crossings.

RESPONSE:

While Arctic Gas proposes to design special drainage and erosion control measures to suit site specific conditions where required, it is considered highly unlikely that this situation will prevail at all designated stream crossings of which there are approximately 150 in the Yukon and Northwest Territories. It is suggested that the typical drainage and erosion control measures will be applicable to the approach slopes at many of these designated stream crossings.

RECOMMENDED ALTERNATIVE

16. Site specific plans and proposals shall be presented for the design and installation of erosion control measures at designated stream crossings where required. In particular, special plans will be required at all major river crossings proposed to be constructed in summer. Plans for typical drainage and erosion control measures are to be presented as part of the preliminary design submission for all designated crossings.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 12)

17. In the location, design and construction of facility sites, work pads and airfields, the following objectives shall be pre-eminent:
- a) Surface and shallow subsurface drainage shall not be disturbed to the extent that water is ponded on or at the ground surface adjacent to the pads or any other place.
 - b) There shall be no channelizing of overland flows or other concentrated drainage which could lead to mechanical or thermal erosion. In the case of ditches to lead water around the edge of pads and airfields, the ditch floors shall be protected from erosion by ditch checks, non-erosive blankets of clay or gravel, synthetic fibre mats or any other method acceptable to the Agency.
 - c) Water draining away from pads or airstrips shall be dispersed over the ground surface.
 - d) The side slopes of all pads shall be protected from eroding.
 - e) Particular attention shall be paid to drainage and erosion control at all sites used during construction of the pipeline but then closed down and not used during operations and maintenance. This includes, but is not limited to borrow sites (especially borrow sites on river flood plains), spoil disposal sites, wharves, stockpile sites and the work pads used in the construction of major river crossings.
 - f) Sediments, particularly silt particles, entrained in flowing water shall be prevented from reaching any waterbodies or from being deposited on land except in designated areas. Sufficient stilling ponds, settling basins, sediment traps or other devices shall be installed to ensure this.
 - g) Any drainage water from a pad that contains any petroleum products or other chemicals shall be trapped, contained and disposed of according to the provisions of the section on "Spill Prevention and Control".

RESPONSE:

As pointed out in response to Recommendation 14 of this section,

Pipeline and Facilities
Drainage and Erosion Control

Sub-Paragraphs (a), (b), and (f) are clearly impossible to comply with as written. Drainage from pads and airfield is considered a site specific design concern. It should be directed toward a water course, if possible. It is suggested that this recommendation be rewritten deleting Sub-Paragraphs (a), (c) and (f) and making other minor corrections or changes as follows:

RECOMMENDED ALTERNATIVE:

17. In the location, design and construction of facility sites, work pads and airfields, the following objectives shall be pre-eminent:

- a) There shall be no channelizing of overland flows or other concentrated drainage which could lead to detrimental mechanical or thermal erosion. In the case of ditches, to lead water around the edge of pads and airfields, the ditch floors shall be protected from erosion by ditch checks, non-erosive blankets of clay or gravel, synthetic fibre mats or any other method acceptable to the Agency.
- b) The side slopes of all pads shall be protected from eroding.
- c) Particular attention shall be paid to drainage and erosion control at all sites used during construction of the pipeline but then closed down and not used during operations and maintenance. This includes, but is not limited to, borrow sites (especially borrow sites on river flood plains), spoil disposal sites, wharves, stockpile sites and the workpads used in the construction of major river crossings.

Pipeline and Facilities
Drainage and Erosion Control

- d) Any drainage water from a pad designated as a petroleum product or other chemicals storage area shall be trapped, contained and disposed of according to the provisions of the section on "Spill Prevention and Control".

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 13)

18. In the location, design and construction of all roads and trails, whether permanent or temporary, the following objectives shall be pre-eminent:
- a) Surface and shallow subsurface drainage shall not be disturbed to the extent that water is ponded on or at the ground surface adjacent to the roadway or any other place.
 - b) There shall be no channelization of overland flow or other concentrated drainage which could lead to mechanical or thermal erosion. In the case of roadside ditches, the ditch floors shall be protected from erosion by ditch checks, non-erosive blankets of clay or gravel, synthetic fabric mats or any other method acceptable to the Agency. No roadside ditches shall be excavated in permafrost terrain.
 - c) For permanent project roads and temporary roads that are to be in place during the summer, sufficient through grade culverts shall be installed to allow the free passage of overland drainage. Each culvert shall be equipped with a ditch block or diversion structure to minimize flows of water alongside road berms.
 - d) Permanent project roads and temporary roads that are to be in place during the summer shall have appropriately sized and constructed culverts at all stream crossings. The culverts shall be sized and designed in accordance with the Fisheries Service Guidelines. Bridges shall be used in place of culverts if required by the Agency or the Fisheries Service. Low water crossings shall not be constructed in such roads.
 - e) For the requirements associated with snow roads, reference should be made to that section.

RESPONSE:

This recommendation is written in a parallel vein to 14 and 17 and the response thereto applies. Specifically, it is not possible to comply with Recommendation 18 a). It is therefore suggested that the recommendation be rewritten as follows:

RECOMMENDED ALTERNATIVE:

18. In the location, design and construction of all roads and trails, whether permanent or temporary, the following objectives shall be pre-eminent:

- a) There shall be no channelization of overland flow or other concentrated drainage which could lead to detrimental mechanical or thermal erosion. In the case of roadside ditches, the ditch floor shall be protected from erosion by ditch checks, non-erosive blankets of clay or gravel, synthetic fibre mats, fabric mats or any other method acceptable to the Agency. Roadside ditches shall not be excavated in sensitive permafrost terrain (or may wish to use "ice-rich" in lieu of "sensitive").
- b) For permanent project roads, or temporary roads that are to be emplaced during the summer, sufficient through grade culverts shall be installed to allow the passage of overland drainage. Each culvert shall be equipped with a ditch block or diversion structure to minimize flow of water alongside the berms.
- c) Permanent project roads and temporary roads that are to be emplaced during the summer shall have appropriately sized and constructed culverts at all crossings. Culverts shall be sized and designed in accordance with the Fisheries Service Guidelines. Bridges shall be used in place of culverts if required by the Agency or the Fisheries Service. Low water crossings shall not be constructed isuch roads.

Pipeline and Facilities
Drainage and Erosion Control

- d) For the requirements associated with snow roads, reference should be made to that section.

Pipeline and Facilities
Drainage and Erosion Control

RECOMMENDATION: (Page 14)

19. The Company and the Agency shall agree on the schedule, level of detail and scale of presentation review and approval of submissions regarding drainage and erosion control measures.

RESPONSE:

Acceptable

Pipeline and Facilities
Revegetation

RECOMMENDATION: (Page 3)

1. Revegetation shall be planned and implemented as a complement to other drainage and erosion control measures rather than as an end in itself. First priority shall be given to areas where there is a high potential for erosion and major concerns over the environmental impact of erosion.

The Company will ensure that revegetation (together with the necessary clean-up, re-grading, preparation of drainage and erosion control structures, etc.) is completed promptly after termination of pipeline construction activity or other land-use of the site.

To this end priority will be placed by the Company on the manpower, logistic and supply requirements of the revegetation program needed to meet the planned revegetation schedule.

RESPONSE:

Acceptable

Pipeline and Facilities
Revegetation

RECOMMENDATION: (Page 3)

2. The Company shall, as part of its preliminary design, demonstrate to the Agency by an approved field test or tests in the project area the suitability of its proposed revegetation procedures for the control of erosion on slopes and cuts.

RESPONSE:

Unacceptable

Revegetation of cut slopes in permafrost terrain has been undertaken by others. Field tests at the preliminary design stage are not required. The alternative methods proposed by CAGSL have been used extensively and successfully in temperate regions. If documentation of the application of these methods by others in permafrost regions is inadequate, a field test will be initiated prior to construction in order that procedures can be assessed and modified during construction, if required.

RECOMMENDED ALTERNATIVE

2. The Company shall demonstrate to the Agency the suitability of its proposed revegetation procedures for the long term control of erosion on slopes and cuts. The supportive evidence will consist of documentation of successful application by others or, if necessary, field tests at suitable sites.

Pipeline and Facilities
Revegetation

RECOMMENDATION: (Page 3)

3. The Company shall, at the design review stage, submit to the Agency its general plans for revegetation of the right-of-way and other disturbed areas. This plan shall indicate the kinds of seed mixtures and where they will be used, the vegetative methods to be used and where, the amount and type of fertilizer, the types of equipment and their application and timing. The appropriate documentary evidence in support of these procedures shall also be included.

RESPONSE:

Unacceptable

RECOMMENDED ALTERNATIVE:

3. The Company shall, at the design review stage, submit to the Agency its general plans for revegetation of the right-of-way and other disturbed areas. This plan shall indicate the kinds of seed mixtures and where they will be used, the vegetative methods to be used and where, the amount and type of fertilizer, the types of equipment and their application and timing. Results of field tests and greenhouse experiments in support of these procedures shall also be included.

Pipeline and Facilities
Revegetation

RECOMMENDATION: (Page 3)

4. The Company shall submit to the Agency following the submission of its general plan a specific revegetation plan for each spread detailing manpower requirements and training, logistics, the seed mixes to be used and their rates of application, fertilizer type(s) and rates of application, methods and timing of application, vegetative methods and their application, expected follow-up, revegetation requirements, and procedures to be applied to minimize environmental impacts. These revegetation plans shall also demonstrate how the procedures and the seed-mixes and fertilizer will be adjusted in keeping with changes in topography, soil and drainage.

RESPONSE:

Acceptable

Pipeline and Facilities
Revegetation

RECOMMENDATION: (Page 4)

5. Where site-specific erosion control plans are necessary, the Company shall include the required revegetation procedures as a specific component of this plan.

Information shall be provided to the Agency on the source(s) of the plant material required for revegetation, manpower and aircraft requirements for the collection and placement of the plant material, support camp location, timing, and potential conflicts with wild-life population.

RESPONSE:

Acceptable

Pipeline and Facilities
Revegetation

RECOMMENDATION: (Page 4)

6. The Company shall, as an integral component of its initial revegetation program, monitor the short term success and shall repeat the revegetation measures where required until they are successful. The control of erosion shall be the primary objective of such follow-up revegetation; aesthetic considerations shall be secondary.

RESPONSE:

Acceptable

Pipeline and Facilities
Revegetation

RECOMMENDATION: Page 4)

7. The Company shall monitor, as a part of its operations and maintenance program, the long term success of its revegetation program. Supplementary seeding will be limited to that required for the control of erosion and will not be allowed for only aesthetic or cosmetic reasons. This approach will limit the long term persistence of non-native species along the right-of-way and will encourage the re-establishment of native plant species.

RESPONSE:

Acceptable

Pipeline and Facilities
Revegetation

RECOMMENDATION: (Page 4)

8. The Company shall ensure that any requirements for summer revegetation, whether initial or supplementary, integrate both the needs of the plants for establishment and the avoidance, where possible, of conflicts with wildlife.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Definitions

RECOMMENDATION: (Page 3)

1. The following definitions of watercourses should be used by the Company and the Agency in river engineering design:
 - a) Watercourse: Any identifiable trace made by concentrated runoff water on the earth surface.
 - b) Drainage course; All watercourses smaller than streams as defined below.
 - c) Stream (also river, creek): Watercourses which seasonally offer habitat suitable for fish and/or have an average stream channel width greater than 3 feet and/or carry perennial flows in excess of 0.05 cfs and/or have a drainage area greater than 1 square mile.
 - d) Designated stream (also designated river): A stream or river for which site-specific crossing designs and procedures are required by the Agency. The following streams will be designated: streams with drainage areas greater than 10 square miles; streams with the potential for significant channel shift and scour at the crossing site; streams which support significant fish populations at some time of the year in the vicinity of the crossing site; and streams where the pipeline crossing involves potentially significant technical or environmental hazards.
 - e) Designated major river: A river likely to be crossed on the basis of separate construction contracts and/or a river to be crossed at times that are significantly different from the main pipeline construction. The following river crossings are included in this category: Great Bear, Peel, Mackenzie River, main Mackenzie Delta distributaries and Shallow Bay. Others that possibly would be included are Firth, Old Crow, Hare Indian and Willowlake. The latter two are noted in the Foothills Application.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Definitions

RECOMMENDATION: (Page 4)

2. At the time of submission of the preliminary river crossing design or earlier, a complete listing of all designated streams and all major rivers should be prepared by the Agency (in consultation with the Company) to serve as a reference in design review.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Definitions

RECOMMENDATION: (Page 4)

3. The following definitions of valley components should be used by the Company and the Agency in river engineering planning:

- a) Stream channel (or river channel) zone: Generally the smaller of the following two areas:

the area between the top of distinct stream banks or between distinct trim-lines of forest or tundra vegetation; or

the stream channel area covered by flowing water at least once in two years on a long term average. In the case of braided streams (characterized by multiple, laterally unstable channels), the channel zone includes the entire braided zone.

- b) Floodplain: Low-lying area adjoining a stream channel, underlain by alluvial (river-deposited) materials and subject to occasional flooding (at least once in 100 years on a long term average).
- c) Terrace: Area that was a floodplain at some earlier geologic time but is now relatively higher above the stream (the stream may have incised itself) and therefore not subject to flooding, or only subject to very infrequent, minor flooding.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Design Flows and Levels

RECOMMENDATION: (Page 3)

1. Pipeline crossings of all designated rivers are to be designed to withstand standard project flood conditions. The standard project flood is a flood estimate based on the assumption that the most severe storm or other meteorological conditions considered reasonably characteristics of the specific region is occurring (Snyder 1964). The largest flood considered physically possible if all flood-producing factors were to combine (probable maximum flood) is normally about twice as large as the standard project flood.

RESPONSE:

Arctic Gas rejects the concept of stipulations couched in the terms of the "Standard Project Flood" as being not in the best interests of the project either economically or environmentally. Firstly, the application of the standard project flood (SPF) to design of Arctic Gas pipeline crossings would probably not be considered appropriate by advocates of the concept. Snyder (1964), in relating to the SPF is clearly discussing design of reservoirs and more specifically the capacity of reservoir spillways. The SPF is suggested as a spillway design flood for intermediate sized reservoirs where there is some small, but possible, loss of life as well as substantial financial loss. He states "the failure damage potential for dams in the "intermediate" category is sufficiently large to justify a relatively high degree of security in selection of a spillway design flood.

Chow in the Handbook of Applied Hydrology (McGraw-Hill, 1964), a widely accepted basic text in hydrology, following U.S. Army Corp of Engineers CWE Bulletin 52-8 states: "The SPF represents the flood discharge that

should be selected as the design flood for the project...where some small degree of risk can be accepted by an unusually high degree of protection is justified by hazards to life and high property values within the area to be protected".

Secondly, there is much criticism of the use of the "design storm" approach implicit in the use of the standard project flood. Linsley (1975) is also an eminent hydrologist who refers to the concept in the following terms:

"Because of difficulties in estimating flood frequency for ungauged watersheds or where records are short, the concept of the design storm has developed. A rainfall time intensity pattern is selected and the runoff hydrograph or peak flow is calculated by techniques discussed in Chapters 7 and 8 or, in many cases, an empirical formula. The technique is even extended to large areas, and an aerial pattern of rainfall is specified for the design storm. It is sometimes assumed that the probability of the derived flood flow is the same as that of the design rainfall. This assumption is rarely right and often grossly in error. A storm includes a time-intensity pattern, an areal pattern, and the total rainfall. It is really impossible to assign a frequency to such a complex event. Usually only the total rainfall is considered. Since the time-intensity and areal patterns affect runoff volume and flood peak, storms with the same rainfall volume seldom produce the same flood peak. In addition, a storm occurs in a sequence of events which fix antecedent conditions, and in turn, runoff volume and hydrograph shape.

A single design storm, even if the frequency is known accurately, is inadequate for the economic analysis which should be made for flood mitigation, storm drainage, culvert design, etc. The preferred procedure is to synthesize the longest possible flood series and derive a frequency relation from the synthetic data. The design storm approach is seldom warranted except when there has been a policy decision that the structure should be designed for the probable maximum event."

Pipeline and Facilities
Crossings: Design Flows and Levels

Snyder (1964) agrees that the probability of the standard project flood is unknown. He states that the probability of a standard project storm is indeterminate on the basis of information now available and that the probability will vary substantially, according to the size of the area involved, as well as the meteorological characteristics prevailing in various regions of the country.

Arctic Gas has gone to considerable expense and retained wide expertise in the field of hydrology in order to develop this second approach, that is, to derive flood frequency relations for individual basins on the basis of meteorological and geomorphological data. With these studies now largely completed, Arctic Gas is in a position to predict flows of any return period for any basin. We consider that this is a far more flexible, meaningful, and useful approach than the so-called standard project flood and can be used to ensure designs are economically and environmentally optimum. In any event, the standard project flood is appropriate to the design of spillways but inappropriate to the design of pipeline river crossings.

Finally, the use of the SPF by Alyeska is not sufficient precedent for its use by CAGSL. Alyeska was simply seeking a regional method for estimating a flood of high return period and chose the SPF approach out of necessity. Choosing an arbitrarily large design flood is no guarantee of minimum environmental damage and we suggest return periods more consistent with current highway practice be recommended.

RECOMMENDED ALTERNATIVE:

1. Pipeline crossings are to be designed to withstand the 100 year flood without damage to the crossing.

REMARKS:

See Attachment concerning proposed design.

RECOMMENDED ALTERNATIVE:

2. Design water levels, due to the temporary nature of any other hydrological or hydrological studies which affect the design of the proposed project, are to be determined on the basis of the best available data or, in any event, to not be lower than they are at least as conservative as the 100 year flood.

Pipeline and Facilities
Crossings: Design Flows and Levels

RECOMMENDATION: (Page 3)

2. Design water levels due to ice jamming or to storm surges or any other meteorological or hydrological design criteria affecting the design of the designated stream crossings are to be determined in such a manner that they are at least as conservative as the standard project flood. This means that the most severe meteorological or hydraulic conditions reasonably characteristic of the general region have to be assumed in determining design levels. This is generally achieved by transposing the most severe conditions ever observed anywhere in the region to the site of interest.

RESPONSE:

Unacceptable

See discussion concerning Standard Project Flood.

RECOMMENDED ALTERNATIVE

2. Design water levels, due to ice jamming or to storm surges or any other meteorological or hydrological design criteria affecting the design of the designated stream crossings are to be determined on the basis of the best available data or in any event, in such a manner that they are at least as conservative as the 100 year flood.

Pipeline and Facilities
Crossings: Design Flows and Levels

RECOMMENDATION: (Page 3)

3. Design flows and levels for all other (non-designated) stream crossings are to be selected in such a manner that they are reasonably consistent with (i.e. bear same degree to risk as) the standard project flood but individual standard project floods do not need to be determined. A regional analysis based on multiple regression of design flows on drainage basin parameters or based on the grid-square technique would be acceptable.

RESPONSE:

Unacceptable

See discussion of standard project flood.

RECOMMENDED ALTERNATIVE:

3. Design flows and levels for all other (non-designated) stream crossings are to be selected in such a manner that they are reasonably consistent with the 100 year flood, but individual flood values need not be determined.

RECOMMENDATION: (Page 3)

4. Permanent stream crossings of access roads are to be designed to withstand 1-in-50 year conditions of flow or water levels.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Design Flows and Levels

RECOMMENDATION: (Page 4)

5. Temporary facilities such as work pads in rivers, perimeter dikes of gravel mining schemes in channel zones, coffer dams, etc., are to be designed on the basis of a 1-in-25 year probability level.

RESPONSE:

Unacceptable

Arctic Gas is of the view that citing a specific probability level for a wide range of works is too rigid and not the most appropriate approach. This is particularly so in view of the fact that we have developed methods of predicting flows of a wide range of return periods for any given site.

RECOMMENDED ALTERNATIVE

5. Temporary facilities such as work pads in rivers, perimeter dikes of gravel mining schemes in channel zones, coffer dams, etc. are to be designed on the basis of a flood probability level most appropriate to the work in question, bearing in mind the siting, timing and anticipated life of the structure concerned.

Pipeline and Facilities
Crossings: Design Flows and Levels

RECOMMENDATION: (Page 4)

5. The last two design flow specifications refer to the probability at which the safety of the structure from flood damage has to be assured. Many of these structures will also have to meet certain hydraulic criteria for fish passage described elsewhere.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Design Flows and Levels

RECOMMENDATION: (Page 4)

7. Besides determining the appropriate design flows and levels, the Company is to submit as part of the preliminary design submission, all supporting data and computations to the Agency for review. A separate submission is needed for each designated stream crossing while all other crossings can be dealt with on a spread-by-spread or regional basis.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 2)

1. Certain sections of most rivers and river valleys should be avoided by river crossings because of technical difficulty or because of environmental or land use concerns. Therefore, selection of crossing locations to avoid such unsuitable sites should precede finalization of the route of the pipeline.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Design Criteria

Timing of Construction

RECOMMENDATION: Page 2)

2. The potential for the stream course and the pipeline to run parallel as a result of a shift in the stream course, shall be prevented by careful siting of crossings in reaches where the stream is stable and straight. The pipeline shall cross flood plains and channel zones as directly as possible (20:2400; 78:11657; PAAG p. 223).

RESPONSE:

Not acceptable. While it is highly desirable that river crossings be located within straight reaches, this is not always possible, bearing in mind the other factors which influence route location.

ALTERNATIVE RECOMMENDATION:

2. The potential for the stream course and the pipeline to run parallel as a result of a shift in the stream course, shall be prevented by careful siting of crossings in reaches where the stream is reasonably stable. The pipeline shall cross flood plains and channel zones as directly as practicable.

Pipeline and Facilities
Crossings: Design Criteria

Frost Heave

RECOMMENDATION: (Page 12)

15. The recommendations in the section of this report dealing with Frost heave in general cover the concerns relating to heave of underwater crossings.

RESPONSE:

Acceptable.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 3)

3. A site-by-site evaluation is necessary to determine the approach to be adopted where highway and pipeline crossings are close together. Safety, aesthetics and certain geotechnical problems tend to suggest wide separation but close spacing might minimize the impact on fisheries and facilitate future maintenance (78:11653-54; 109:16671-72; PAAG pp. 351-53).

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 3)

4. Where preliminary pipeline crossings of designated streams fall within one mile of a permanent road crossing of the same stream, the Company shall decide the most desirable separation and then justify its proposal before the Agency. The Agency may specify a distance of separation.

RESPONSE:

Unacceptable

It is clear that the Company must have continuing input into the final selection of river crossing locations. It is unacceptable for the Agency to unilaterally preclude a significant reach of the river because this could have far-reaching implications for the system, the environment and the ultimate cost of the project. It is suggested that, where there is any possibility that the Agency prefers an alternative crossing, a decision be reached at an early date in the design phase of the project.

RECOMMENDED ALTERNATIVE

4. Where preliminary pipeline crossings of designated streams fall within one mile of the permanent road crossing of the same stream, the Company shall decide the most desirable separation and then justify its proposal before the Agency. The Agency and the Company will establish a mutually agreeable crossing location at an early stage of the final design phase.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 4)

5. The sag bends of all designated stream crossings are to be located far enough beyond the channel zone to assure that they will still be outside the channel zone by a safe distance after 50 years of natural, unimpeded channel zone migration. The Agency may waive this requirement if the Company can show conclusively that deep burial beyond the channel zone will do more damage than the construction of river training works needed to avoid deep burial.

RESPONSE:

Arctic Gas agrees with the spirit of this recommendation to set the sag bends beyond the safe zone covering 50 years migration by a stream channel; however, the recommendation as stated, completely ignores consideration of the feasibility and cost of construction, the potential for slope problems, the potential for environmental damage, etc. The mechanism for review of each designated stream crossing design by the Agency will surely be capable of handling this problem.

RECOMMENDED ALTERNATIVE

5. The sag bends of all designated stream crossings are to be located and/or protected so that they will not become exposed during the life of the pipeline.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 5)

6. Permanent river training works in the channel zone are to be avoided wherever possible. Unavoidable training works aimed at preventing a river from taking off along the pipeline right-of-way or from entering a flood plain gravel pit, or designed to prevent cut-offs or avulsions, are to be located preferably on flood plains rather than in channel zones.

RESPONSE:

Unacceptable.

It is the view of Arctic Gas that the Commission Counsel has taken an unnecessarily pessimistic view of training works in general. Certainly, well designed and constructed channel training works need not interfere considerably with a river by obstructing fish, causing siltation or being plain ugly, as suggested in the discussion. In fact, on the contrary, some well designed and constructed river bank armouring will prevent siltation and can be quite attractive.

The wording of the recommendation is rather restrictive. The Agency should have the scope to accept the best design to meet the site conditions at hand. Each must be treated on its own merits.

RECOMMENDED ALTERNATIVE

6. River training works in the channel zone will be permitted where these represent the best overall solution to a crossing problem, bearing in mind engineering, environmental and construction concerns. Such training works will be sited to best achieve their objective and minimize the impact on the channel environment.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 6)

7. Preliminary design proposals for all designated stream crossings (and for any other crossing required by the Agency) will be accompanied by conclusive evidence that:
 - a) maintenance of groundwater flow in the general area of the crossing in winter is not of environmental importance; or
 - b) maintenance of such flow is of environmental importance but that installation of a crossing without special mitigative measures will not have adverse environmental effects.

Where the above conditions cannot be met (i.e. where special protection measures are known to be needed or where there is no conclusive demonstration that they are not needed), the crossing design will incorporate measures that assure continued winter groundwater and channel flow across the installation so as to provide adequate protection of fish populations and the aquatic ecosystem that supports them.

RESPONSE:

Acceptable

RECOMMENDATION: (Page 7)

8. The Company will build and test a physical model of a stream crossing little or no winter channel flow but significant groundwater flow. This model will demonstrate that the proposed means of assuring groundwater flow across the frost bulb are effective, and that the structures can be installed without significantly increasing environmental impact of the construction process. Its effectiveness in maintaining the following parameters shall be demonstrated:
- a) a similar flow of water across the frost bulb to points downstream, as would occur naturally;
 - b) normal physical water quality characteristics such as suspended sediment, dissolved oxygen, and temperature;
 - c) normal chemical water quality characteristics such as pH, conductivity and colour; and
 - d) normal invertebrate and fish communities (including eggs) in overwintering areas downstream.

RESPONSE:

Unacceptable.

The modelling of a stream crossing to demonstrate impact on water quality, invertebrates, fish, etc. may not be possible. It is very probable that this would require a full scale field test at a cost of several hundred thousand dollars which then leaves the difficulty of extrapolating the results to all other possible conditions. The proposed laboratory model may simply not reflect natural conditions, such as permeability and aufeis. Geothermal analyses, which are now available, can do the job both better and cheaper.

The most recent evidence obtained by Arctic Gas (NESCL, 1976 Geophysical Surveys of Rivers of the Arctic Coastal Plain in the

Pipeline and Facilities
Crossing: Design Criteria

Yukon Territory) shows clearly that the concern is very isolated. Mitigative measures such as insulation are available for use where required.

RECOMMENDED ALTERNATIVE:

8. Delete Recommendation 8

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 8)

9. Where preliminary design review indicates that a buried crossing would involve substantial unresolved environmental concerns, the Agency should instruct the Company to prepare a comparison of the buried crossing with an overhead crossing and to justify its choice of crossing mode in both engineering and environmental terms.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 9)

10. Buoyancy control weights that cannot slip off or anchors are required at river crossings for the entire length of pipe submerged under design flow conditions. Where concrete jacket around the pipe is proposed, the Company shall demonstrate that the jacket cannot crack and spall.

RESPONSE:

Unacceptable.

Arctic Gas agrees with the spirit of this recommendation but considers that it may be extremely difficult to demonstrate that a continuous concrete jacket cannot crack.

RECOMMENDED ALTERNATIVE

10. Buoyancy control weights that cannot slip off or anchors are required at river crossings for the entire length of pipe submerged under design flow conditions. Where a concrete jacket around the pipe is proposed, the company shall demonstrate that the concrete has adequate strength, durability and reinforcement to last the life of the project.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 9)

11. Concrete weights that cannot slip off are to be applied to all parts of the pipeline system on the Mackenzie Delta.

RESPONSE:

Unacceptable.

Arctic Gas considers that this recommendation is far too specific and therefore unacceptable. For example, why are frost anchors eliminated from parts of the pipeline system on the Mackenzie Delta? This is inconsistent with Recommendation 10 which permits anchors at other river crossings.

RECOMMENDED ALTERNATIVE:

11. The Arctic Gas Pipeline will be designed to resist buoyant forces on all parts of the Mackenzie Delta which are subject to flooding.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 10)

12. The security of all crossings of designated streams against scour or general river bed degradation from any cause is to be assured at a level of risk comparable to the standard project flood.

RESPONSE:

Unacceptable.

Arctic Gas agrees in general with the tenor of the discussion preceding this recommendation, however, it believes that there are more meaningful standards than the "Standard Project Flood" (Design Flows and Design Levels, Recommendation No. 1).

RECOMMENDED ALTERNATIVE

12. The security of all crossings of designated streams against scour or general river bed degradation from any cause, is to be assured at a low level of risk.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION: (Page 11)

13. The Company's preliminary design submission to the Agency for each designated major river crossing shall include a statement of the environmental rationale involved in the decision to use a single or dual crossing. The Agency may extend this requirement to crossings of other large rivers. The environmental rationale for any dual crossing shall include the approaches as well as the crossing itself (for instance the Arctic Gas plan for the dual crossing of the East Channel of Mackenzie River at Swimming Point involves a crossing of fish-sensitive Holmes Creek).

RESPONSE:

Unacceptable.

It should be noted that the decision to install certain dual crossings has resulted from a consideration of the down time or loss of service in the event of a failure. It has not been a strictly environmental rationale. It should also be noted that Arctic Gas no longer proposes crossings in the vicinity of Swimming Point or Holmes Creek.

RECOMMENDED ALTERNATIVE

13. The Company's preliminary design submission to the Agency for each designated major river crossing shall include a statement of the rationale involved in the decision to use a single or dual crossing. The Agency may extend this requirement to crossings of other large rivers. The submission shall include consideration of the approaches as well as the crossing itself.

Pipeline and Facilities
Crossings: Design Criteria

Dual Crossings

RECOMMENDATION: (Page 11)

14. If the project involves a dual pipeline across the Mackenzie Delta, "cross-overs" between the two pipes should be installed during pipeline construction to increase flexibility in repair scheduling.

RESPONSE:

The decision as to whether cross-overs should be installed during initial pipeline construction should be made during the final design stage. The recommendation then, should read:

ALTERNATIVE RECOMMENDATION:

14. Across the Mackenzie Delta consideration should be given to the installation of cross-overs between the two pipes during the final design stage.

Pipeline and Facilities
Crossings: Design Criteria

RECOMMENDATION (Page 12)

The recommendations in the section of this report dealing with frost heave in general cover the concerns relating to heave of underwater crossings.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Construction

Timing of Construction

1. The Company shall prepare detailed schedules for all construction work associated with crossings of designated streams and shall submit evidence showing that the schedule is realistic with adequate contingency allowances. Evidence is also required to show that the proposed schedule does not interfere with significant biological activities and resources and that it also does not clash with traditional human activities. The freezing applies not only to the construction but to all logistics associated with it.

RESPONSE:

There are several phrases within this recommendation that are not completely clear to Arctic Gas. For example, "adequate contingency allowances"; "significant biological activities"; "traditional human activities". It appears words such as "adequate", "significant", and "traditional", in this connotation require some further definition. Further, it is not clear to what extent freezing applies to the construction of the crossings.

ALTERNATIVE RECOMMENDATION:

1. The Company shall prepared detailed schedules for all construction work associated with crossings of designated streams and shall submit evidence showing that the schedule is realistic. Evidence is also required to show that the proposed schedule does not unduly interfere with significant biological activities and resources. Changes to the schedules require approval of the Agency.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 2)

2. On request from the Agency, the Company shall draw up construction plans for crossing selected designated streams at times other than winter, and shall evaluate these plans for feasibility, cost and environmental impact. These plans will be implemented if so requested by the Agency.

RESPONSE:

Acceptable.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (page 2)

3. Summer construction of new training works is to be avoided, unless all necessary materials and equipment can be brought to the site by water or by air.

RESPONSE:

This recommendation appears to be unnecessarily restrictive. There may well be several sites where the necessary materials and equipment could be mobilized over winter roads and/or all weather roads where the latter is available.

RECOMMENDED ALTERNATIVE:

3. Summer construction of new training works is to be avoided, unless all necessary materials and equipment can be brought to the site without doing permanent damage to the terrain.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 2)

4. The approaches to summer-constructed river crossings are to be built in winter.

RESPONSE:

The meaning of the term "approaches" is unclear. It has always been the intent of Arctic Gas to do the work on the banks and approach slopes to major river crossings following the advent of freezing weather in the fall. This would be particularly important at those crossings where the approach slopes are ice-rich or otherwise less stable under thawing conditions. There may be situations, however, where this restriction is neither necessary nor desirable.

RECOMMENDED ALTERNATIVE

4. The work pads and access to summer constructed river crossings, where necessary, are to be built in winter.

Pipeline and Facilities
Crossings: Construction

Installation of the Pipe

RECOMMENDATION: (Page 5)

5. The Company shall endeavour to have at least 2 years of periodic winter flow observations for all designated stream crossings prior to completion of final design.

RESPONSE:

Arctic Gas agrees with the intent behind this recommendation, and to this end, has already made observations of winter flow for at least one year at streams along the Arctic Coastal Plain as well as others in the Mackenzie Delta and in the Mackenzie Valley. On the other hand, it may be difficult to comply with the stipulation in its entirety. There are a great many of the smaller designated streams which clearly do not have a winter flow.

ALTERNATIVE RECOMMENDATION:

5. The Company shall endeavor to have at least 2 years of periodic winter flow observation for selected designated stream crossings prior to final design.

Pipeline and Facilities
Crossings: Construction

Installation of the Pipe

RECOMMENDATION: (Page 5)

6. Before completion of final design, the Company shall develop and test a construction technique (such as diversion or pumping) that permits pipe laying in the dry across any streams with winter flow up to 100 cfs.

RESPONSE:

Acric Gas reject as being quite impracticable the requirement to install a pipe in the dry across streams with winter flows up to 100 cfs.

ALTERNATIVE RECOMMENDATION:

Delete this recommendation.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 5)

7. All winter construction of crossings in watercourses containing overwintering fish or spawning areas less than 5 miles downstream is to be done in the dry by waiting for the stream to dry up, by diverting the stream, or by staging construction using cofferdams. Water flow, including intragravel movement, shall be maintained to any fish or egg overwintering areas and siltation shall be controlled to levels outlined in "Suspended Sediment Standards".

RESPONSE:

Arctic Gas agrees with the intention to avoid siltation of fish wintering areas and spawning beds of fall spawners downstream of the pipeline crossings. Because of widely different slope and bed material, the downstream distance of potential impact varies greatly from stream to stream. Estimates of this distance can be made on a site specific basis.

As part of final design, thorough field studies will be undertaken to locate fish overwintering and spawning areas downstream of the stream crossings. where it is likely that siltation will adversely affect such areas, appropriate mitigation will be employed. It is clearly impracticable to prevent the subsurface flow of water through the ditch.

RECOMMENDED ALTERNATIVE

Delete this recommendation

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 5)

8. The pipe trench across the stream shall be backfilled with channel bed material.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 5)

9. As part of the planning for summer built crossings, the Company shall evaluate several alternate spoil deposal schemes from economic, technical and environmental points of view. At least three ranked schemes shall be submitted for approval in principle.

RESPONSE:

The requirement to submit three ranked schemes appears to be unnecessary in view of the review procedures recommended for designated streams.

RECOMMENDED ALTERNATIVE

9. As part of the planning for summer built crossings, the Company shall evaluate several alternate spoil disposal schemes from economic, technical and environmental points of view. The best scheme from all points of view, shall be submitted for approval in principle.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 5)

10. If spoil disposal into the river channel is proposed, the Company must show that this does not increase the channel velocity to interfere with navigation or fish migration, and does not lead to increases in suspended sediment that are hazardous to fish (See "Suspended Sediment Standards").

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 5)

11. Ditch plugs shall be left in place on both sides of stream crossings until the last possible minute, to assure that little or no ditch drainage flow can enter the stream and no streamflow can enter the ditch.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Construction

Installation of the Pipe

RECOMMENDATION: (Page 5)

12. The interference with aquifers below winter-dry channels is to be minimized. In particular, the Company shall avoid plugging aquifers with silt or contaminating the groundwater in any way. The construction time of crossings interfering with such aquifers is to be kept as short as possible.

RESPONSE:

Not acceptable. The recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

12. The interference with aquifers below winter-dry channels is to be minimized. In particular, the Company shall avoid plugging aquifers with silt or contaminating the groundwater in an unacceptable way. The construction time of crossings interfering with such aquifers is to be kept as short as possible.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 6)

13. Blasting should conform to the proposals listed in "Underwater Blasting".

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 6)

14. Work pads and cofferdams will be designed to withstand the 1-in-25 year flood condition derived for the period of the year during which the pad or cofferdam will be in the channel zone.

RESPONSE:

Unacceptable

Arctic Gas agrees with the intent but not the wording.

RECOMMENDED ALTERNATIVE:

14. Work pads and cofferdams are to be designed on the basis of a flood probability level most appropriate to the work in question, bearing in mind the siting, timing and anticipated life of the structure concerned.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 6)

15. The size of work pads or of the diked areas in the channel at any one time will be limited in such a manner that they do not interfere with fish migration or navigation and do not cause significant erosion at the 1-in-25 year flood condition.

RESPONSE:

Arctic Gas is of the view that citing a single probability level for a wide range of works is too rigid and not the most appropriate approach. This is particularly so in view of the fact we have developed methods of predicting flows with a wide range of return periods for any given site.

RECOMMENDED ALTERNATIVE:

15. The size of work pads or of the diked areas in the channel at any one time will be limited in such a manner that they do not interfere with fish migration or navigation and do not cause significant erosion at a flood level most appropriate to the work in question, bearing in mind the siting, timing and anticipated life of the structure concerned.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 7)

16. At no time shall a work pad or a diked area occupy more than two-fifths of the channel zone width.

RESPONSE:

The wording of this recommendation is too rigid. It should be related in some way to the apparent concern.

RECOMMENDED ALTERNATIVE:

16. At no time shall a work pad or a diked area occupy so much of the channel zone width that it will create a barrier to the migration of fish or contribute to unacceptable levels of siltation or other environmental damage.

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 7)

17. Any borrow or spoil materials left in the river after removal of a work pad and any such material that is allowed to be eroded by the river shall not cause changes to the channel or bank morphology or to the river bed that are detrimental to fish or wildlife or to any other use of the watercourse.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 9)

18. On the completion of in-stream pipeline construction, all stream beds are to be restored to their original shape using native or closely similar materials. On request, the Agency may relieve the Company from this requirement if he can show that the stream in question is sufficiently active to assure restoration of the stream bed during the first freshet following construction, and if this does not interfere with the biological resources of the stream.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Construction

RECOMMENDATION: (Page 10)

19. Stream banks are to be restored as close to their original shape as drainage and slope stability considerations permit. The re-stored banks are to be as erosion resistant as the natural banks immediately upstream and downstream from the crossing.

RESPONSE:

Acceptable

Pipeline and Facilities
Crossings: Monitoring

RECOMMENDATION: (Page 1)

1. A monitoring plan and schedule shall be submitted to the Agency for approval with the final design for each designated river crossing. Site-specific adjustments to the plan may be submitted up to the time of commissioning of the pipe. During operation of the pipeline, the appropriate governmental body may carry out or instruct the Company to carry out additional monitoring at any river crossing.

RESPONSE:

Acceptable

2. In general, the monitoring program should consider the following

Pipeline and Facilities
Crossings: Monitoring

RECOMMENDATION: (Page 2)

2. In general, the monitoring program should include the following components:
 - a) vertical stereoscopic and photo coverage at an appropriate scale once a year or more frequently for any crossing of a stream showing significant post channel migration or bank erosion.
 - b) Channel soundings once a year for designated major stream crossings with mobile bed subject to scour: the soundings should extend over a channel reach of about 10 channel widths upstream and downstream from the pipeline;
 - c) soundings and other observations at crossings where major ice jams occur: as soon as possible after each ice jam has formed the crossing site should be sounded for scour holes and a procedure for detecting scour depth beneath ice jams should be developed;
 - d) flow measurements and water level records during winter at crossings where low water flow or groundwater is important to overwintering fish: this could include water yield of springs, piezometric measurements of groundwater, and observations on icings;
 - e) Suspended sediment concentration (see "Suspended Sediment Standards");
 - f) position of the pipe relative to an established datum at crossings where the post bulb around the chilled pipe could encounter frost-susceptible soils.

RESPONSE:

Not acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

2. In general the monitoring program should consider the following components:

- a) vertical stereoscopic and photo coverage at an appropriate scale once a year or more frequently for any crossing of a stream showing significant post channel migration or bank erosion;
- b) channel soundings once a year for designated major stream crossings with mobile bed subject to scour: the soundings should extend over a channel reach of about 10 channel widths upstream and downstream from the pipeline;
- c) soundings and other observations at crossings where major ice jams occur: as soon as possible after each ice jam has formed the crossings site should be sounded for scour holes and a procedure for detecting scour depth beneath ice jams should be developed;
- d) flow measurements and water level records during winter at crossings where low water flow or groundwater is important to overwintering fish: this could include water yield of springs, piezometric measurements of groundwater, and observations on icings;
- e) suspended sediment concentration (see "Suspended Sediment Standards");
- f) position of the pipe relative to an established datum at crossings where the post bulb around the chilled pipe could encounter frost-susceptible soils.

Pipeline and Facilities
Crossings: Monitoring

RECOMMENDATION: Page 2)

3. On 31 August of each operating year the Company shall submit a report to the appropriate regulatory body summarizing the findings of the monitoring of stream crossings during the previous year.

RESPONSE:

Not acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

3. On 31 August of each operating year the Company shall submit a report as required to the appropriate regulatory body summarizing the findings of the monitoring of stream crossings during the previous year.

Pipeline and Facilities
Crossings: Monitoring

RECOMMENDATION: (Page 2)

4. After five years of operation of the pipeline, the Company may request reduction of the stream crossing monitoring program.

RESPONSE:

Not acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

4. The Company may request reduction of the stream crossing monitoring program in accordance with the appropriate regulatory requirements.

Pipeline and Facilities
Location of Facilities

RECOMMENDATIONS: THE COMPANY

RECOMMENDATION: (Page 3)

1. The final location of compressor stations shall reflect the joint impact of the following concerns on major valleys, environmentally and biologically sensitive areas, scenic areas and areas important to native people:
 - (a) the cumulative and synergistic effect of all facilities associated with the compressor stations; and
 - (b) the operational lifetime of facilities and activities.

RESPONSE:

Acceptable.

Pipeline and Facilities
Location of Facilities

RECOMMENDATIONS: THE COMPANY

RECOMMENDATION: (Page 3)

2. The Company shall comply with Social Guideline No. 4, "1972 Pipeline Guidelines".

RESPONSE:

Acceptable.

Pipeline and Facilities
Location of Facilities

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 3)

3. As a general guide, the Company shall not locate facilities complexes within three miles of a major valley edge. "Major valley" is to be defined by the Agency, but would not be restricted to perennial streams since major streams, particularly on the North Slope freeze to the bottom in winter.

RESPONSE:

The stipulation that facility complexes not be located within three miles of a major valley edge could severely restrict the economic optimization of compressor station spacing.

ALTERNATIVE RECOMMENDATION:

3. As a general guide, the Company shall not locate facilities complexes within one-half mile of a major valley edge. "Major valley" is to be defined by the Agency, but would not be restricted to perennial streams since major streams, particularly on the North Slope freeze to the bottom in winter.

Pipeline and Facilities
Location of Facilities

RECOMMENDATIONS: THE COMPANY

RECOMMENDATION: (Page 4)

4. In all cases where the Company hopes to have this constraint waived, it shall submit in a form that facilitates checking and verification, detailed plans and comparison of the technical, capital and operating costs, and the environmental and social impact differences for an acceptable site (outside the three mile limit) as well as its proposed alternative. In particular, data and printouts related to the hydraulics and economics of compressor station spacing shall be submitted in a form readily verifiable by the Agency.

RESPONSE:

Delete "detailed plans" from the third line of recommendation and substitute "locations." "Detailed plans" infers that detailed final designs would be done for both locations. This would involve a considerable design effort which we feel would not be necessary in order to compare the two sites. Delete "technical" from the fourth line of the recommendation. We do not know what is meant by "technical costs." On the sixth line of the recommendation, change "three mile limit" to "one-half mile limit." This would then agree with the proposed change to recommendation #3 on the preceding page.

Pipeline and Facilities
Location of Facilities

ALTERNATIVE RECOMMENDATION:

4. In all cases where the Company hopes to have this constraint waived, it shall submit in a form that facilitates checking and verification, locations and comparison of the capital and operating costs, and the environmental and social impact differences for an acceptable site (inside the one-half mile limit) as well as its proposed alternative. In particular, data on printouts related to the hydraulics and economics of compressor station spacing shall be submitted in a form readily verifiable by the Agency.

Pipeline and Facilities
Location of Facilities

RECOMMENDATIONS: THE GOVERNMENT

RECOMMENDATION: (Page 4)

5. The Agency should critically review the Company's compressor station locations bearing in mind the 1972 Pipeline Guidelines and the other concerns outlined above.

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

RECOMMENDATIONS: THE COMPANY

Overall Plan

RECOMMENDATION: (Page 4)

1. Prior to commencement of final design the Company shall submit for Agency approval camps, wharves and stockpile sites for all documenting:
 - (a) The location of all such facilities (in map form) relative to the pipeline right-of-way, the Mackenzie River, existing communities and existing or proposed (by others) rights-of-way such as the Mackenzie Highway, existing wharf sites, winter roads etc.
 - (b) The general work schedules for each facility. Each wharf site and stockpile site shall be designated with alternative sites that would be acceptable to the Company if the Agency feels that the prime site is undesirable.
 - (c) The design standards to be applied to the wharves, stockpile sites.
 - (d) The total estimated capital cost and the annual operation and maintenance cost of each permanent and temporary wharf. Upon request, a net present value analysis shall be prepared for each proposed new wharf and an incremental operating and maintenance cost increase analysis shall be prepared for any existing facility that is proposed for upgrading. A cost-benefit analysis of specified alternatives to the Company's plans shall also be prepared if requested by the Agency.
 - (e) The rationale that was used in determining the design standard and location for each particular work and in particular, the rationale used in the Company's decision to:

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

- (i) build new wharves and stockpile sites rather than use existing facilities vice versa; and
 - (ii) use temporary rather than permanent wharves and stockpile sites or vice versa.
- (f) The general borrow areas that will be used to construct the works.
- (g) All assumptions that the Company has made with respect to the availability of existing wharves, stockpile and other transport facilities, and the approximate volume of project related traffic that such facilities will sustain over the life of construction (broken down into monthly winter and summer periods) and during pipeline operation (broken down on a quarterly basis).
- (h) All assumptions the Company has made with respect to work by parties not associated with the pipeline company (i.e. extensions to the Mackenzie Highway, expansion of existing stockpile, wharves etc. works constructed by the gas producers etc.).

RESPONSE:

These recommendations are acceptable with the exception of 1 (b) and 1 (d). There is little to be gained by consideration of alternative sites for each specific facility proposed, since their functions are inter-related and their locations inter-dependent. It is really only meaningful to talk of alternative layouts for an entire compressor station, wharf, airstrip, stockpile, road complex.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

The capital cost for wharves is readily obtainable, however, the breakdown of annual operating and maintenance costs for each individual wharf would be more difficult to obtain. The annual operating and maintenance cost for an individual wharf could vary from year to year depending on usage, location, possible damage during break up, etc. For this reason, we would prefer not to supply this cost for each individual wharf, but would rather consider it as being a small element of the overall annual operating and maintenance costs of the pipeline. In the few cases where existing facilities are upgraded detailed estimates of incremental operations and maintenance costs will be developed if requested.

ALTERNATIVE RECOMMENDATION:

1. b) The general work schedules for each facility;
1. d) The total estimated cost of each permanent and temporary wharf.

Other information requested by the Agency will be provided.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

SITE-SPECIFIC APPLICATION

RECOMMENDATION: (Page 5)

2. The site-specific application shall include:
- (a) a map indicating the exact location of all proposed wharves, stockpile sites and camps with supporting socio-economic and environmental information used in location;
 - (b) the detailed schedules of construction and use;
 - (c) the maximum anticipation of traffic volumes and camp populations during various pipeline construction periods and during pipeline operation;
 - (d) detailed construction drawings and specifications;
 - (e) the exact location of borrow material sources and haul routes along with the quantities and quality of such material (see Borrow Operations);
 - (f) the capital, operation and maintenance costs (for new or upgraded facilities) that will be borne by the Company and that the Company anticipates will have to be borne by others; and
 - (h) post construction plans designating facilities required for operation and maintenance, the method of payment for ongoing use, the plans for facilities that are no longer required and the overall abandonment plans at the end of the useful life of the project or facility.

RESPONSE:

Acceptable.- except for (f) - refer to item 1 (d)

ALTERNATIVE RECOMMENDATION

2. (f) the capital, operation and maintenance (for upgraded facilities only) costs that will be borne by the Company and that the company anticipates will have to be borne by others; and

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS

RECOMMENDATION: (Page 6)

3. The location and design of all camps, wharves and stockpile sites shall account for the site specific features of the local environment including:
 - (a) geotechnical considerations (permafrost);
 - (b) drainage and erosion control (particularly for facilities located in the Delta);
 - (c) wildlife habitat and migration;
 - (d) fish habitat and migration patterns;
 - (e) land use patterns;
 - (f) human settlements and camps; and
 - (g) archaeological resources.

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS

RECOMMENDATION: (Page 6)

4. Wharf and stockpile sites shall be located away from the confluence of rivers and river mouths unless otherwise specifically approved by the Agency. The location and design of stockpile sites shall be cognizant of river flood stages and storm surges.

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS:

RECOMMENDATION: (Page 7)

5. Wharf and stockpile sites shall be located at sites that provide the best possible opportunity to implement effective contingency plans in the event of an oil spill or similar event. Reaches of rivers with fast water, limited access, important biological or social features etc. should be avoided.

RESPONSE:

Selection of wharf and stockpile locations will consider associated facility locations i.e. Compressor stations, road access in addition to prevention of spills by locating stockpiles above ice push-up levels and in stable areas.

ALTERNATIVE RECOMMENDATION:

5. Wharf and stockpile sites shall be located at sites that provide the best opportunity, compatible with project requirements, to implement effective contingency plans in the event of an oil spill or similar event. Reaches of river with fast water, limited access, important biological or social features etc., should be avoided if possible.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS:

RECOMMENDATION: (Page 7)

6. All fuel product piping systems at wharves, camps and stockpile sites shall be located above ground.

RESPONSE:

It would be the Company's intention to normally install the fuel product piping systems above ground. However, underground installation may be performed in some locations e.g. Road Crossings.

All fuel product piping systems at wharves, camps and stockpile sites shall generally be located above ground.

ALTERNATIVE RECOMMENDATION:

6. All fuel product piping systems at wharves, camps and stockpile sites shall generally be located above ground.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS

RECOMMENDATION: (Page 7)

7. All wharves, stockpile sites and camps shall be equipped with spill prevention, control and clean up devices. (see "Spill Prevention and Control").

RESPONSE:

Acceptable

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS

RECOMMENDATION: (Page 7)

8. The location of camps, wharves and stockpile sites shall conform to the proposals for protecting raptors and waterfowl presented in the section on "Birds".

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS

9. Camps shall be located preferentially at stockpile sites, wharves or compressor station sites. Applications for camps located outside these areas shall be supported by explaining why such sites are undesirable.

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS

10. The camps built or used by the Company shall be self sufficient with their own support facilities such as power supply, water supply, sewage treatment and disposal, first aid station, recreation etc.

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

LOCATION AND DESIGN CONSIDERATIONS

RECOMMENDATION: (Page 7)

11. All designs, navigation aids etc. for wharves shall meet the requirements of the Ministry of Transport for the nature of the particular facility and the traffic types and volumes anticipated.

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

Location and Design Considerations

RECOMMENDATION: (Page 7)

12. Wherever possible dead anchors for wharf sites should be pile driven or drilled rather than excavated and back filled. Approaches to the beach from the upper plateaus should be by fill rather than cutting through the embankment.

RESPONSE:

In thaw stable materials and at specific sites, it may be preferable to use dead man anchors, i.e., continuous structures, which require excavation and backfilling and depend on the mobilization of passive pressure to provide anchorage.

It would be preferable to use fill for beach approaches rather than cut in thaw-unstable materials. However, in thaw-stable materials, it could be economical to adopt conventional cut and fill methods.

ALTERNATIVE RECOMMENDATION:

- 12 In thaw-stable materials excavated and back filled, dead man anchors may be utilized. Approaches to the beach from the upper plateaus should preferably be by fill rather than cutting through the embankment in thaw-unstable materials.

PIPELINE AND FACILITIES
CAMPS, WHARVES AND STOCKPILE SITES

RECOMMENDATION: (Page 8)

14. The cost of construction, operation and maintenance associated with the expansion or upgrading of existing wharves and stockpile sites shall be assumed by the Company unless otherwise previously agreed to by the government.

RESPONSE:

Certain wharves which the Company may wish to upgrade may not be owned by the Government, in which case the Company would reserve the right to negotiate operating and maintenance costs with the facility owners.

ALTERNATIVE RECOMMENDATION:

14. The cost of construction, operation and maintenance associated with the expansion or upgrading of existing wharves and stockpile sites shall be assumed by the Company unless otherwise previously agreed to by the government or the owner of the facility.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

Construction and Maintenance

RECOMMENDATION: (Page 8)

15. Upon abandonment, the facilities shall be removed and the area restored in a manner approved by the Agency.

RESPONSE:

Not acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

15. Upon abandonment the facilities shall be removed if required by the Agency and the area restored in a manner approved by the Agency.

PIPELINE AND FACILITIES
CAMPS, WHARVES AND STOCKPILE SITES

RECOMMENDATION: (Page 8)

16. All camps, wharves and stockpile sites shall be located as detailed in the approved design. No such facilities should be established with field without Agency approval.

RESPONSE:

There appears to be a typographical error in the third line -
"with" should be changed to "in the".

ALTERNATIVE RECOMMENDATION:

16. All camps, wharves and stockpile sites shall be located as detailed in the approved design. No such facilities should be established in the field without Agency approval.

PIPELINE AND FACILITIES
CAMPS, WHARVES AND STOCKPILE SITES

RECOMMENDATION: (Page 8)

17. Where the Company uses existing wharves and stockpile sites that use shall be planned and amended on a daily and seasonal basis so that priority is given to the ongoing use by others.

RESPONSE:

It would be the Company's intention to ensure that the ongoing use of these facilities by present users will not be jeopardised. However, the allocation of priority use on a daily basis to all others would be unduly restrictive.

The question of priority use should also take into account the facility extensions that may be provided by the Company.

ALTERNATIVE RECOMMENDATION:

17. Where the Company uses existing wharves and stockpile sites, that use shall be planned so that the ongoing use of these facilities by present users is not jeopardised.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

ACCESS AND OPERATION

RECOMMENDATION: (Page 8)

18. Access to facilities built by the Company for its own use shall be limited to Company or government personnel. The Company should take all reasonable steps to discourage access by local people and any others not employed by the Company, the Agency or any of their contractors and subcontractors who are actively engaged on the project. In particular the Company should limit access to construction camps to only those persons associated by employment on that portion of the work.

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

Access and Operation

RECOMMENDATION: (Page 8)

19. All persons using camp facilities shall be limited to the jobsite and campsite areas. The Company should use the full extent of its legal and corporate ability to achieve this end.

RESPONSE:

CAGSL agrees with the intent of this recommendation but feel the wording should be as follows:

ALTERNATIVE RECOMMENDATION:

19. The Company shall use the full extent of its legal and corporate ability to ensure that all persons using camp facilities shall be limited to the jobsite and campsite areas.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

RECOMMENDATIONS: THE GOVERNMENT

Existing and Proposed Facilities

RECOMMENDATION: (Page 9)

20. Before granting a right-of-way permit the government should establish a clear policy regarding the Company's use of existing wharves and stockpile sites and the limits to the Company's prerogatives in establishing new facilities. Such a policy statement should indicate:
- (a) the exact nature, location and standard of all works to be undertaken by government or crown corporations;
 - (b) a definitive timetable for all such works;
 - (c) the acceptable location, duration of use etc. of new facilities that might be required by the Company (i.e. Axe Point); and
 - (d) cost sharing arrangements, if any (capital, operation and maintenance).

RESPONSE:

Acceptable.

Pipeline and Facilities
Camps, Wharves and Stockpile Sites

Recommendations: The Government

Existing and Proposed Facilities

RECOMMENDATION: (Page 9)

21. The Agency should assess the Company's requirements and plans for camps, wharves and stockpile sites with the view of integrating the Company's requirements with ongoing and long-range government and community planning in the Mackenzie Valley. The Company's facilities should be made to complement the aspirations within existing communities and the ongoing planning process.

RESPONSE:

Not acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

21. The appropriate government authority should assess the Company's requirements and plans for camps, wharves and stockpile sites with the view of integrating the Company's requirements with ongoing and long-range government and community planning in the Mackenzie Valley. The Company's facilities should be made to complement the aspirations within existing communities and the ongoing planning process.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: (Page 3)

1. Prior to commencement of final design the Company shall submit for government approval an Overall Plan for all roads, airstrips and helipads documenting:
 - (a) The location of all roads, airstrips and helipads (in map form) relative to the pipeline right-of-way, the Mackenzie River, existing communities and existing or proposed (by others) facilities such as the Mackenzie Highway, land lines, winter roads, borrow pits and wharves. Each airstrip and helipad location shall be designated with possible alternative sites that would be acceptable to the Company if the Agency feels that the prime site is undesirable.
 - (b) The design standards to be applied to the various parts of the works including stream and river crossings.
 - (c) Estimates of the capital cost and the annual operation and maintenance cost of each airstrip, helipad and each segment of continuous road of a specified design standard. A net present value analysis shall be prepared for each proposed new airstrip and an incremental operating and maintenance cost increase analysis shall be prepared for any existing facility that is proposed for upgrading.
 - (d) The rationale that was used in determining the design standard and location for each particular work and in particular, the rationale used in the Company's decision to:
 - (i) use gravel instead of snow roads,
 - (ii) build new airports or helipads rather than use existing facilities and vice versa,
 - (iii) use airstrips rather than helipads or vice versa and
 - (iv) use new rather than existing rights-of-way.
 - (e) The general borrow areas that will be used to construct the works.

Pipeline and Facilities
Roads, Airstrips, Helipads

- (f) All assumptions that the Company has made with respect to the availability of existing roads, airports and helipads and the approximate volume of project related traffic that such facilities will sustain over the life of construction (broken down into monthly winter and summer periods) and during pipeline operation (broken down on a quarterly basis).
- (g) All assumptions the Company has made with respect to proposed road, airstrip or helipad built by parties not associated with the pipeline company (e.g. extensions to the Mackenzie Highway, works constructed by the gas producers etc.).

RESPONSE:

(b), (d), (e), (f) Acceptable.

(a) Unacceptable.

Submitting alternative sites for each airstrip and helipad along with the prime sites would involve a tremendous amount of office design and field investigation which would be wasted if the prime site location is acceptable. We would propose to submit alternative locations only if the prime locations are unacceptable to the Agency.

(c) Unacceptable.

This recommendation is similar to 1(d) for camps, wharves and stockpile sites. Information pertaining to capital costs for these facilities is readily obtainable, however, breakdown of annual operation and maintenance costs for a specific item like a section of road or a helipad is more difficult as it is a small element of the overall

Pipeline and Facilities
Roads, Airstrips, Helipads

Annual operation and maintenance costs of the pipeline. In the few cases where existing facilities are upgraded detailed annual maintenance costs will be developed.

ALTERNATIVE RECOMMENDATION:

1. a) The location of all roads, airstrips and helipads (in map form) relative to the pipeline right-of-way, the Mackenzie River, existing communities and existing or proposed (by others) facilities such as the Mackenzie Highway, land lines, winter roads, borrow pits and wharves. Alternative locations for airstrips and helipads shall be submitted if the prime sites are unacceptable to the Agency.
1. c) The total estimated capital cost of each airstrip, helipad, and each segment of continuous road. Other information requested by the Agency will be provided.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: (Page 5)

2. The site-specific application shall include:

- (a) a map indicating the exact location of all proposed roads, airstrips and helipads with supporting socio-economic and environmental information used in location;
- (b) the schedule of construction and duration of use;
- (c) the maximum anticipated traffic volumes during various pipeline construction periods and during pipeline operation;
- (d) detailed construction drawings and specifications showing compliance with government design standards for roads, airstrips and helipads;
- (e) the exact location of borrow material sources and haul routes along with the quantities and quality of such material (see (Borrow Operations));
- (f) the use of insulation or other non-granular materials in the embankment;
- (g) all thermal analyses and geotechnical information used in design;
- (h) the location and size of all fill stockpiles designated for maintenance or other uses;
- (i) all fish and wildlife information used in location and design;
- (j) the designs and design criteria employed to facilitate the passage of ungulates and fish;
- (k) the methods and needs for maintenance including snow removal, snow fencing, grading etc.;
- (l) the capital, operation and maintenance costs that will be borne by the Company and that the Company anticipates will have to be borne by others; and

Pipeline and Facilities
Roads, Airstrips, Helipads

- (m) post construction plans designating facilities required for operation and maintenance, the method of payment for ongoing use, the plans for facilities that are no longer required and the overall abandonment plans at the end of the useful life of the project or facility.

RESPONSE:

(a), (b), (c), (d), (e), (f), (g), (h), (i), (j), (k), (m)

Acceptable.

(l) Unacceptable.

We would prefer not to supply operating and maintenance costs for those facilities which will be maintained by the Company. The reasons for this are given for item 1(c) on Page 3 for this section.

RECOMMENDED ALTERNATIVE:

2. (1) The capital costs that will be borne by the Company and the capital, operating and maintenance costs that the Company anticipates will have to be borne by others.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: (Page 6)

3. Each road, airstrip or helipad that is proposed for the Northern Yukon or in the Mackenzie Delta shall be the subject of a separate application for a separate notice to proceed.

RESPONSE:

Unacceptable.

This recommendation would create an additional and unnecessary workload on both the Company and the Agency and could lead to unnecessary delays in the project. We would recommend that one application be submitted and one notice to proceed be received for everything related to a compressor station or stockpile site complex.

RECOMMENDED ALTERNATIVE:

3. All roads, airstrips or helipads that are related to a compressor station complex or a stockpile site complex located in the Northern Yukon or in the Mackenzie Delta shall be the subject of a single application for a single notice to proceed.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 6)

4. Where the Company plans to use permanent or snow road alignments that parallel substantial parts of the proposed Mackenzie Highway, detailed capital and maintenance cost estimates of the road work shall be included in the application.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 6)

5. The location and design of all roads, airstrips and helipads shall account for the site-specific features of the local environment including:
- (a) geotechnical considerations (permafrost);
 - (b) drainage and erosion control;
 - (c) wildlife habitat and migrations;
 - (d) fish habitat and migration patterns;
 - (e) land and water use;
 - (f) human settlements and camps; and
 - (g) archaeological resources.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 7)

6. Unless otherwise specifically approved by the Agency, all roads, airstrips and helipads shall be located at least 300 feet from any river, lake or stream.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 7)

7. The location of roads, airstrips and helipads shall conform to the proposals for protecting raptors, waterfowl and mammals presented in "Birds" and "Terrestrial and Aquatic Mammals".

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

LOCATION AND DESIGN CONSIDERATIONS:

RECOMMENDATION: (Page 7)

8. All roads, airports and helipads shall be built to comply with government standards. In particular, the minimum standard for roads shall be as designated for "Airport Roads" as specified in the Northern Roads Classification System Standards unless specifically otherwise approved by the government. Furthermore, the design and construction shall comply with the standards described in the Fisheries Service guidelines for highway construction in the Northwest Territories.

RESPONSE:

The Fisheries Service guidelines recommend the following maximum design velocities for road culverts:

- Mean Annual Flood - 3 feet per second, 3 day delay.
- Fifty Year Flood - 3 feet per second, 7 day delay.

The Mackenzie Highway culverts are designed on the following basis:

- Fifty Year Flood - 5 feet per second, 7 day delay.

The similarity in conditions relating to the pipeline and the Mackenzie Highway lead us to favour the Highway standards for culvert hydraulic design.

The Fisheries Service guidelines recommend against removal of gravel from active river channels. This requirement is too restrictive as it should be possible to remove gravel from active river channels in some areas without undue deleterious effects.

Pipeline and Facilities
Roads, Airstrips, Helipads

The Fisheries Service guidelines concerning road routing (river crossings not closer than 1500 feet to favoured fish spawning and feeding regions) are too restrictive on a site specific basis.

ALTERNATIVE RECOMMENDATION:

8. All roads, airports and helipads shall be built to comply with government standards. In particular, the minimum standard for roads shall be as designated for "Airport Roads" as specified in the Northern Roads Classification System Standards unless specifically otherwise approved by the government. Furthermore, the design and construction shall comply with the standards described in the Fisheries Service guidelines for highway construction in the Northwest Territories, excluding the recommendations pertaining to:
 - (i) Hydraulic design standards for road culverts;
(Hydraulic design standards for road culverts shall conform to the Mackenzie Highway standards).
 - (ii) Gravel removal from active river channels.
 - (iii) Routing.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 7)

9. If the Company decides that any shoo-fly roads are to be permanent for operation and maintenance reasons, the shoo-fly roads shall be designated as permanent and shall be designed as all other permanent roads with due attention in the design to drainage etc.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 7)

10. All designs, navigation aids etc. for airstrip or helipad facilities shall meet the requirements of the Ministry of Transport for the nature of the particular facility and the traffic types and volumes anticipated.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: (Page 7)

11. The cost of all construction, operation and maintenance associated with new roads, airports and helipads shall be borne entirely by the Company.

RESPONSE:

Unacceptable.

The government or various other industrial companies may wish to utilize these facilities at some future date. In this case the Company would want the option to negotiate sharing the operating and maintenance costs of these facilities.

RECOMMENDED ALTERNATIVE:

11. The cost of all construction, operation and maintenance associated with new roads, airports and helipads shall be borne by the Company, or as negotiated with other industrial or government users.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: (Page 7)

12. The cost of construction, operation and maintenance associated with the expansion or upgrading of existing roads, airports and helipads shall be assumed by the Company unless otherwise previously agreed to by the government.

RESPONSE:

Unacceptable.

Certain of these facilities which the Company may wish to upgrade may not be owned by the government, in which case the Company would reserve the right to negotiate operating and maintenance costs with the facility owners.

RECOMMENDED ALTERNATIVE:

12. The cost of construction, operation and maintenance associated with the expansion or upgrading of existing roads, airports, and helipads shall be assumed by the Company unless otherwise previously agreed to by the government or the owner of the facility.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 8)

13. The Company shall have archaeological expertise on-site during construction in all areas determined to have archaeological significance.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

Recommendation: The Company

RECOMMENDATION: (Page 8)

14. During construction the Company shall limit the use of all new airports, roads and helipads built for the project to vehicles and aircraft associated with the project except for emergency situations that pose a threat to human life.

RESPONSE:

Not acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

14. During construction the Company shall limit the use of all new airports, roads and helipads built for the project to vehicles and aircraft associated with the project except for emergency situations.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 8)

15. After construction and during pipeline operation the Company shall, at the request of the government, limit access to those roads, airstrips and helipads that are required for operation purposes and shall remove or otherwise obstruct access in a manner approved by the government to facilities that are not required.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 8)

16. Vehicles on the project shall be operated only on the designated rights-of-way or on the lands leased or owned by the Company unless otherwise approved by the government.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE COMPANY

RECOMMENDATION: (Page 8)

17. Where the Company uses existing roads, airports or helipads, it shall assure the availability of the facility for the ongoing needs of others. The Company shall plan and amend its daily and seasonal operations so that they do not prejudice normal use or access by others.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips and Helipads

Recommendation: The Company

RECOMMENDATION: (Page 8)

18. All roads, airports and helipads shall be located and operated only as detailed in the approved design. No field or other approvals shall be given for any works outside the areas specifically designated in the application.

RESPONSE:

Not acceptable. This recommendation should read as follows:

ALTERNATIVE RECOMMENDATION:

18. All roads, airports and helipads shall be located and operated as detailed in the approved design. No changes will be made in the field unless approved by the Agency.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATIONS: THE GOVERNMENT

RECOMMENDATION: (Page 9)

19. Before granting a right-of-way permit the government should make a clear statement on what policy will be followed with respect to the Company's use of existing roads, airstrips and helipads. Such a policy statement should indicate:
- (a) the exact nature, location and standard of all works to be undertaken by government or crown corporations;
 - (b) a definitive timetable for all such works; and
 - (c) the acceptable locations for major new facilities that might be required by the Company, and cost sharing arrangements, if any (capital, operation and maintenance).

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE GOVERNMENT

RECOMMENDATION: (Page 9)

20. The government should reassess its policy and plans for a Mackenzie Highway considering the concerns of the indigenous peoples, the concerns of wildlife experts, the reality of the pipeline project's needs and the needs of such a highway for future development in the Mackenzie Valley.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE GOVERNMENT

RECOMMENDATION: (Page 10)

21. The government should assess the Company's requirements and plans for roads, airstrips and helipads with the view of integrating the Company's requirements with ongoing and long range government and community planning in the Mackenzie Valley and Northern Yukon. The Company's facilities should be made to complement the aspirations of existing communities and the ongoing planning process.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE GOVERNMENT

RECOMMENDATION: (Page 10)

22. The government should, after reviewing the Company's preliminary design, make a detailed and broad transportation study in order to optimize the long range benefits of all road, airstrip and helipad works to be undertaken by the Company. Such a study should account for the desirability to limit access to part of the area traversed by the pipeline and should define ways of access limitation achievable through:
- (a) the Company's design and location and abandonment of roads, airports and helipads, and
 - (b) the government's policy to use Company facilities (including roads) during and after the pipeline construction and operating periods.

RESPONSE:

Acceptable.

Pipeline and Facilities
Roads, Airstrips, Helipads

RECOMMENDATION: THE GOVERNMENT

RECOMMENDATION: (Page 10)

23. The government should make an unequivocal policy that there will be no permanent road construction along or adjacent to the right-of-way in the Northern Yukon NO MATTER WHAT TYPE OF DIFFICULTY THE PIPELINE CONSTRUCTION OR OPERATION ENCOUNTERS. The Company should therefore be advised that this section of the line would have to be abandoned rather than permit an all-weather road to be built.

RESPONSE:

Acceptable.

Pipeline and Facilities
Compressor Station Noise

Recommendations: The Company

RECOMMENDATION: (Page 2)

1. Normal operating noise levels 1,500 feet from the centre of the compressor station shall not exceed 50 dBA under calm conditions at all seasons of the year.

RESPONSE:

Acceptable.

Pipeline and Facilities
Compressor Station Noise

Recommendation: The Company

RECOMMENDATION: (Page 3)

2. Achievable noise levels will vary from one station site to another depending on topography and vegetative cover, but shall in no case exceed those prescribed in recommendation 1.

RESPONSE:

Acceptable.

Pipeline and Facilities
Compressor Station Noise

Recommendation: The Company

RECOMMENDATION: (Page 3)

3. The Company shall comply with higher standards of operating compressor station noise attenuation in those sensitive areas such as the Delta or North Slope as may be required and specified by the Agency.

RESPONSE:

Should add "reasonably attainable" to recommendation as follows:

ALTERNATIVE RECOMMENDATION:

3. The Company shall comply with reasonably attainable higher standards of operating compressor station noise attenuation in those sensitive areas such as the Delta or North Slope as may be required and specified by the Agency.

Pipeline and Facilities
Compressor Station Noise

Recommendation; The Company

RECOMMENDATION: (Page 3)

4. The Company shall monitor the noise level of each compressor station location as prescribed by the Agency and report the results to the Agency within six months of startup of each station.

RESPONSE:

Acceptable.

Pipeline and Facilities
Compressor Station Noise

Recommendation: The Company

RECOMMENDATION: (Page 3)

5. The Company shall make a detailed survey of each compressor station location and shall submit its survey results, noise attenuation rationale, and compressor station equipment specifications to the Agency for review and approval in the final design.

RESPONSE:

Acceptable.

Pipeline and Facilities
Compressor Station Noise

Recommendation: The Government

RECOMMENDATION: (page 3)

6. The Government should identify those areas in which compressor station noise attenuation measures above and beyond conventional, may be necessary to protect populations of wildlife or birds.

RESPONSE:

Acceptable.

Pipeline and Facilities
Blowdown Noise

RECOMMENDATION: (Page 2)

1. The Company shall attenuate maintenance blowdown noise at each station by appropriate choice of vent line diameter, blow off tanks and duration of operation or other appropriate means so that the blowdown noise at the location used for measurement of background station noise is not greater than the allowable operating noise level of the particular station at that location.

RESPONSE:

Station and pipeline maintenance blowdowns are a rare occurrence and there timing can be controlled. The recommendation as written is too rigid and should be written as follows:

ALTERNATIVE RECOMMENDATION:

1. At the preliminary design stage the Company shall present plans for the attenuation of maintenance blowdown noise at stations for Agency review. These plans shall take into account the frequency and duration of maintenance blowdowns and provide estimates of noise levels.

Pipeline and Facilities
Blowdown Noise

RECOMMENDATION: (Page 2)

2. The Company shall not purge the pipeline without warning residents who may be within range and shall not purge the pipeline when concentrations of wildlife or waterfowl are in the vicinity that could be unduly disturbed (see sections on birds and mammals), or shall sustain the duration of the purging so that the noise level does not exceed 50 dBA 1,000 feet from the site of operations (see also Recommendations under "Blasting").

RESPONSE:

The pipeline will be purged at the completion of construction just prior to going into service and is a once only occurrence. The noise levels contained in the recommendation are too rigid. This recommendation should be written as follows:

ALTERNATIVE RECOMMENDATION:

2. The Company shall not purge the pipeline without warning residents who may be within range and shall not purge the pipeline when large concentrations of wildlife or waterfowl are in the immediate vicinity that could be unduly disturbed. The duration of purging shall be controlled to the extent possible so that noise levels are not unduly high.

Pipeline and Facilities
Blowdown Noise

RECOMMENDATION: (Page 2)

3. In those locations where blowdown noise attenuation devices are lacking but blowdown procedures must be used to expel liquids or foreign material from the pipe concentration of wildlife or waterfowl are in the vicinity that could be adversely affected (see also sections under "Wildlife Protection").

RESPONSE:

We do not understand the recommendation and are unable to respond.

CONSTRUCTION SERVICES AND ACTIVITIES

CONSTRUCTION

1. The Chapter shall also be responsible for providing the necessary information and data to the County Engineer for the preparation of the plan and specification for the construction of the project.

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CONSTRUCTION SERVICES & ACTIVITIES

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- Borrow Operations
- Blasting
- Wastewater & Sewage
- Solid Wastes
- Solid/Liquid Wastes Const. & Ind.
- Water Supplies & Intakes
- Pipe Testing
- Spill Prevention & Control
- Fire Prevention & Control

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

1. The Company shall make individual applications for permission to open and develop each borrow pit or quarry necessary for the construction of the pipeline and associated facilities.

RESPONSE:

Acceptable.

RECOMMENDATION:

2. Each application shall be accompanied by a site plan, a mining or extraction plan and sufficient geotechnical and other information so as to clearly demonstrate the viability of the proposed development. In particular, the Company shall carry out sufficient geotechnical investigations of all potential pit or quarry sites to ensure that no sites are opened that are subsequently found to contain unsuitable material to justify the existence of the pit or quarry.

RESPONSE:

This recommendation is not acceptable as written because it is impossible to guarantee that all pit and quarry sites will be adequate even after geotechnical investigations are carried out prior to opening up a pit.

ALTERNATIVE RECOMMENDATION:

2. Each application shall be accompanied by a site plan, a mining or extraction plan and geotechnical and other information that shows the viability of the proposed development. There is always a possibility that during development a pit or quarry may prove to be unsuitable even after preliminary geotechnical investigation. If a pit or quarry is opened and found unsuitable it will be closed and restored in an environmentally acceptable manner.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

3. Each application shall be accompanied by a description of one or more possible alternative sites, with the probable environmental impacts of developing both the preferred and the alternative sites and a statement of the relative merits of the preferred and alternative sites.

RESPONSE:

Recommendation 3 is unacceptable as written. Alternative sites should be studied by Arctic Gas in case field investigations prove that preferred sites are unacceptable. However, detailed pre-engineering of one or more alternative sites for each borrow location is time consuming and possibly unnecessary. Moreover, it is the function of the group granting permission for pits and quarries to compare environmental implications and relative merits of various sites.

ALTERNATIVE RECOMMENDATION:

3. Each preferred site application shall be accompanied by a brief description of a possible alternative site that could be used if the preferred site was rejected. Environmental factors of the alternative site will also be discussed.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

4. As part of the approval process, the Agency shall either confirm the selection of the preferred site, or direct that one of the alternate sites be developed, or that a combination of sites be used. No work, including preparatory activities, shall commence at any site in the absence of a specific statement of approval from the Agency.

RESPONSE:

Recommendation 4 is not acceptable as written because it assumes that CAGSL will have detailed design done on several alternative sites when the preferred site is submitted for approval.

ALTERNATIVE RECOMMENDATION:

4. As part of the approval process, the Agency shall either confirm the selection of the preferred site, or direct that an alternate site or sites be developed. No work, including preparatory activities, shall commence at any site in the absence of approval from the Agency.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

5. Borrow sites shall be selected, operated and restored in locations and in a manner that complies with the recommendations proposed for the protection of birds and mammals listed in "Wildlife Protection".

RESPONSE:

Acceptable.

RECOMMENDATION:

6. The site plans and mining plans shall provide the following information:
 - a) details of the borrow "source" area, thickness, quantity, grade, test pit and bore hole data;
 - b) the placement of the pit and its boundaries in the source area, with estimates of the quantities and grades proposed to be used and remaining;
 - c) the occurrence of permafrost, ground ice and ground water and the location of the water table;
 - d) details of the machinery proposed to be used, the timing of the various operations and the details of any processing operations that may be used;
 - e) details of the access to the pit initially, and from the pit to the point of use of the material;
 - f) plans for drainage, erosion and sediment control during operations;
 - g) the final form of the pit or quarry, with details of the restoration proposals, including spoil disposal, drainage and revegetation;
 - h) an environmental impact statement; and
 - i) any other information required by the Agency or by the Administrator of the Territorial Pits and Quarries Regulations

Construction Services and Activities
Borrow Operations

RESPONSES:

Sections 6.a-h are acceptable. Section 6.i is not acceptable because it lacks specifics and may lead to unnecessary delays in the development application approval.

ALTERNATIVE RECOMMENDATION:

6. i) any other site specific information, required by the Agency or by the Administrator of the Territorial Pits and Quarries Regulations, if it is requested of a particular borrow source before final investigation is undertaken.

RECOMMENDATION:

7. In selecting borrow sites, the Company shall observe the following restrictions:
 - a) geotechnical investigations to locate potential borrow pits are to be done with drills, jack-hammers and backhoes; bulldozers, bucket-loaders and extensive excavation shall not be used;
 - b) all test pits in areas that are not to be used for borrow extraction shall be backfilled and the location rehabilitated;
 - c) deposits of high ice-content material, of material covered with high ice-content overburden or of borrow material overlying high ice-content silts and clays shall be used only if no other material is available; and
 - d) wherever possible existing borrow sites shall be used in preference to the opening of new sites.

Construction Services and Activities
Borrow Operations

RESPONSE:

Recommendations 7.b, 7.c and 7.d are acceptable.

Recommendation 7.a precludes the use of equipment and trenching operations that may provide superior information on material at certain sites.

ALTERNATIVE RECOMMENDATION:

7. a) geotechnical investigations to locate potential borrow pits are to be done with drills, jack-hammers and backhoes wherever feasible. The use of other equipment must have Agency approval. Under certain conditions more extensive excavations, specifically trenching, may be required to delineate areas of adequate or inadequate material supply within a site and to reduce the possibility of opening any unsuitable sites.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

8. In developing borrow sites, the Company shall comply with the following:
- a) access roads shall be routed along existing roads, trails or cutlines wherever possible;
 - b) new access roads shall be cut to a minimum width commensurate with safe operations;
 - c) temporary access roads shall be constructed of packed snow or ice; for standards see "Snow Roads";
 - d) any pit designated for summer operations or for continued use during the operational phase of the pipeline shall be provided all-weather, gravel access road, with culverts; and
 - e) "low-water crossings" shall not be permitted in any borrow pit or quarry access roads.

RESPONSE:

Sections 8.b is acceptable.

Section 8.a is not acceptable because haul distances may be too long.

Section 8.c is not acceptable because it does not consider temporary access roads in non-permafrost areas.

Section 8.d is not acceptable because "designated for summer operations" is not accurately defined. Also a road does not have to be constructed of gravel to be all-weather, i.e. in the Fort Simpson area till is used on some all-weather roads.

Section 8.e is not acceptable.

Construction Services and Activities
Borrow Operations

ALTERNATIVE RECOMMENDATION:

8. a) access roads shall be routed along existing roads, trails or cutlines wherever practical if haul distances are not too great.
- c) temporary access roads in permafrost areas shall be constructed of packed snow or ice; for standards see "Snow Roads". In non-permafrost areas, temporary access roads of winter road design are acceptable.
- d) any pit designated for extraction and hauling of materials from the pit area during the summer or for continued use during the operational phase of the pipeline shall be provided with an all-weather access road, with culverts. The design of such roads will require Agency approval.
- e) "low-water crossings" without the use of culverts or other temporary "bridges" shall not be permitted in any borrow pit or quarry access roads.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

9. In the operation of borrow sites, the Company shall comply with the operating principles as detailed in the "General Criteria For Gravel Borrow Pits in Upland Areas" and in the "General Criteria for Quarry Sites", Appendix A of the CAGPL Responses to PAAG, pp. 45-49 and 59-62 (CAGPL, 1974) and with the following:
- a) Buffer zones of not less than 300 feet shall be left between all waterbodies and the final limits of all pits and quarries.
 - b) Buffer zones of not less than 100 feet shall be left between all public roads and the final limits of all pits and quarries.
 - c) The processing of any material is to be done either in the borrow area or at the site of use of the material, and nowhere else.
 - d) Noisy operations, such as blasting or crushing, shall be undertaken in a manner and at times acceptable to the Agency (see also "Blasting").

RESPONSE:

This recommendation should apply only to upland borrow sites.

Recommendations 9.b and 9.d are acceptable.

Recommendations 9.a and 9.c should be revised as follows.

Construction Services and Activities
Borrow Operations

ALTERNATIVE RECOMMENDATION;

9. In the operation of upland borrow sites, the Company shall comply with the operating principles as detailed in the "General Criteria For Gravel Borrow Pits in Upland Areas" and in the "General Criteria for Quarry Sites", Appendix A of the CAGPL Responses to PAAG, pp. 45-49 and 59-62 (CAGPL, 1974) and with the following:

- a) Adequate buffer zones shall be left between all water-bodies and the final limits of all pits and quarries.
- c) Under normal circumstances the processing of any material is to be done either in the borrow area or at the site of use of the material. Where this is not possible, processing will be undertaken in an environmentally responsible manner subject to the approval of the Agency.

RECOMMENDATION:

10. In closed and abandoned borrow sites, the Company shall comply with the "General Criteria" noted in Recommendation 9, and with the following:

- a) Closed pits shall not be left in a derelict state, but shall be stabilized and rehabilitated promptly.
- b) The rehabilitation of any pit or quarry shall not unduly hinder other parties from re-opening the sites for further use, some time in the future.
- c) Any part of a closed borrow pit or quarry where waste material other than spoil or slash has been buried shall be permanently marked (see also "Solid and Liquid Wastes: Construction/Industrial Activities").

RESPONSE:

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

11. Major changes in borrow pit or quarry locations, operating plans, quantities of material to be removed from any site, closure plans, or any other matter relating to the excavation, transport or placement of borrow material shall be submitted to the Agency for approbation.

RESPONSE:

Acceptable.

RECOMMENDATION:

12. Any fuel oil or other toxic materials stored at or adjacent to borrow sites shall be placed in areas not subject to wetting by ponded surface waters, in areas where vehicles and work equipment cannot damage tanks, bladders or stockpiles of material, and in areas where spills of liquids will be naturally contained. In the absence of suitable material areas within the borrow sites, impervious berms shall be constructed (see also "Spill Prevention and Control").

RESPONSE:

Acceptable.

RECOMMENDATION:

13. Because of the destructive nature of any borrow pit and quarry operations, special care shall be taken in carrying out archaeological surveys of such areas during their development.

RESPONSE:

Acceptable.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

14. In the case of flood plain borrow sites, a buffer zone of 300 feet of undisturbed flood plain terrain is to be left between the channel zone and any proposed flood plain borrow pit.

RESPONSE:

Recommendation 14 is not acceptable since the width of the buffer zone will depend upon the location of the site.

ALTERNATIVE RECOMMENDATION:

14. In the case of flood plain borrow sites, an adequate buffer zone of undisturbed flood plain terrain is to be left between the channel zone and any proposed flood plain borrow pit.

RECOMMENDATION:

15. Dikes and river training works are to be constructed to assure that the pit does not become connected with the river and to prevent the river from changing its course through the pit. The river training works are to be designed for 1-in-100 years flood condition.

RESPONSE:

The last sentence is unacceptable.

Construction Services and Activities
Borrow Operations

ALTERNATIVE RECOMMENDATION:

15. Dikes and river training works ought to be constructed to ensure that the pit does not become connected with the river and to prevent the river from changing its course through the pit. The river training works are to be designed for a flood probability level most appropriate to the work in question bearing in mind the siting, timing and anticipated life of the structure concerned.

RECOMMENDATION:

16. Future water levels in the abandoned pit are to be taken into account in planning the rehabilitation of the pit.

Comment: Since flood plains are flooded occasionally (by definition) the floor of any flood plain excavation is likely to be flooded frequently or it may become permanently submerged. Revegetation needs to take proper account of this.

RESPONSE:

Acceptable.

RECOMMENDATION:

17. The Company shall not open any borrow pits in river channel zones in the Northwest Territories.

Comment: Only a few channel zone pits are being considered by the two Applicants and they conflict with the existing Fisheries Guidelines used in connection with construction of the Mackenzie Highway. In particular, channel zone pits in Willow and Trout River and Francis Creek would be unacceptable.

Construction Services and Activities
Borrow Operations

RESPONSE:

Arctic Gas feels this recommendation is too restrictive.

ALTERNATIVE RECOMMENDATION:

17. The Company shall not open any borrow pits in river channel zones in the Northwest Territories unless approved by the Agency.

RECOMMENDATION:

18. Gravel is to be extracted from stream channel zones only under the following circumstances:
- a) the stream has to have a braided pattern as defined in...
 - b) the channel zone has to be at least three times as wide as the proposed mining operations, and any one pit cannot be longer than the average channel zone width in the reach covered by the pit;
 - c) successive pits in the same stream are to be separated by a distance equal to at least the channel zone width;
 - d) no more than three pits are permitted in any one stream;
 - e) gravel removal shall not occur within one mile of well defined fish spawning, overwintering or rearing areas;
 - f) the total quantity of gravel removed from any channel zone should not amount to more than twenty times the estimated normal annual gravel load of the stream.

Construction Services and Activities
Borrow Operations

RESPONSE:

This entire recommendation is unacceptable as written. The only acceptable portion when rewritten would be section 18.a. Section 18.b has never been explained as being necessary from an environmental point of view, e.g. someone should demonstrate that pits which exceed this dimension will cause damage. Section 18.c is restrictive and has never been demonstrated as the exact width necessary to protect the environment. Section 18.d is unacceptable as no one has demonstrated that more than 3 pits in any one stream has caused environmental damage. Recommendation 18.e is restrictive in terms of safe distances. Perhaps less distance could be tolerated if mitigative measures were put into practice. Recommendation 18.f is also too restrictive and no evidence has been presented that removing more than 20 times the estimated normal annual gravel load of the stream will cause environmental damage.

Construction Services and Activities
Borrow Operations

ALTERNATIVE RECOMMENDATION:

18. Gravel is to be extracted from stream channel zones only as approved by the Agency.
 - a) the stream has to have a braided pattern as defined in the Glossary of Geology.
 - b) if gravel is removed from channel zone borrow sources mining operations will be carried out in an environmentally acceptable manner. The gravel removal operations will take place at a location that is designated as safe to fish spawning, overwintering, or rearing areas. The total gravel resources in any one area of the channel zone will not be removed and the number and spacing of pits will be planned to fulfill this objective.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

19. In addition to the application requirements for borrow pits listed in recommendations 1-3 and 6, the application for a channel zone pit shall include the following items:
- a) Maps and cross sections showing stream channels, the channel zone and flood plains as previously defined, also the main features of the extraction scheme, e.g. windrows, dikes, stockpiles, fuel storage areas, camps, temporary stream crossings, etc.
 - b) Plans for getting machines to the mining sites without damaging terrain.
 - c) Conclusive biological evidence showing that the proposed scheme is not harmful to the fish resources of the river.
 - d) A contingency plan for pollution accidents.
 - e) An analysis of the hydrological regime of the stream giving the following general information:
 - (i) probable distribution of flows during a normal year;
 - (ii) expected extreme high and low flows at roughly the 0.04 level, for each month during which gravel extraction in the channel zone is contemplated; and
 - (iii) an outline of the data and procedures used in obtaining the above, with comments on the reliability of results.
 - f) An analysis of the sediment transport regime of the stream, including: graphs showing the dependence of sediment transport rates on water discharge, with comments on the reliability of the results; a comparison between the quantities of gravel to be removed and the average yearly gravel transport in the river, and notes on the natural rates of channel shifting.

Construction Services and Activities
Borrow Operations

RESPONSES:

Recommendations 19.a, 19.d and 19.e are acceptable.

Recommendation 19.b is not acceptable. Recommendation 19.f is not acceptable and should be deleted since the data required would have to be collected through a major research program over more than a few years in order to obtain significant mean yearly rates.

ALTERNATIVE RECOMMENDATION:

19. b) Plans for getting machines to the mining sites without unacceptably damaging the terrain.
- c) Biological evidence showing that the proposed scheme is not harmful to the fish resources of the river.
- f) Omit.

RECOMMENDATION:

20. The layout of the extraction operations is to be planned in such a manner that interference with the stream environment is minimized. All overburden, debris and brush shall be removed to a location above the maximum high water-wetted perimeter. Minor channels may be shifted in order to dike the perimeter of the mining operation; major re-channelization shall be avoided. Fish migration routes shall be left clear at all times, and natural drainage through the site shall be maintained. Whenever possible, gravel shall be removed from outside the normal high water-wetted perimeter of watercourses.

RESPONSE:

Acceptable.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

21. The borrow operation is to be diked to assure that no surface flows can break into the mining area. The 1-in-25 years probability level applied to the period when the dikes will be in service is to be used in designing the dikes.

RESPONSE:

Unacceptable.

ALTERNATIVE RECOMMENDATION:

21. The borrow operation is to be diked to assure that no surface flows can break into the mining area. The dikes are to be designed on the basis of a flood probability level most appropriate to the work in question, bearing in mind the siting, timing and anticipated life of the structure concerned.

RECOMMENDATION:

22. Extraction shall not be carried out to a depth lower than the average channel floors in the vicinity of the operation.

RESPONSE:

This recommendation is unacceptable as written because in some cases it may be advantageous to excavate to a depth lower than the average channel floor.

Construction Services and Activities
Borrow Operations

RECOMMENDATION: (Page 14)

23. All borrow operations are to be carried out in dry pits under normal circumstances and under no circumstances is work to proceed in more than 2 feet of water.

Comment: Working in water is not desirable because it reduces the chances of successfully cleaning up a pollution accident. River gravels are very permeable so that the silty (and possibly oily) water in the pit could easily contaminate groundwater or the nearby river.

RESPONSE:

Recommendation 23 is not acceptable in its present form because when it is written in this manner it precludes dredging in the Mackenzie River.

ALTERNATIVE RECOMMENDATION:

23. Whenever possible borrow operations will be carried out in dry pits. If circumstances require working in more than 2 feet of water, this work will be done so that fisheries and water resources are protected.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

24. After completion of the operation and before the first spring runoff, or if the water course enters into the site at any time and the site is unusable, the perimeter dikes and the access ramps are to be removed and the area of operation is to be left as a gently sloping plane surface with no depressions readily accessible to re-occupation by stream channels. Any excavation shall be connected to the stream at its downstream end by a stable, sizeable outlet having the same lower elevation as the bottom of the excavation (to prevent the trapping of fish in low water periods). Stream channel banks are to be re-formed to their original shape and revegetated.

RESPONSE:

Recommendation 24 is unacceptable as stream channel banks may be better left to re-stabilize themselves through erosion and revegetation attempted only where the banks were previously vegetated.

ALTERNATIVE RECOMMENDATION:

24. After completion of the operation and before the first spring runoff, or if the water course enters into the site at any time and the site is unusable, the perimeter dikes and the access ramps are to be removed and the area of operation is to be left as a gently sloping plane surface. Any excavation shall be connected to the stream at its downstream end by a stable, sizeable outlet having the same lower elevation as the bottom

Construction Services and Activities
Borrow Operations

of the excavation (to prevent the trapping of fish in low water periods). Stream channel banks are to be re-formed to their original shape and revegetated only where such measures are deemed necessary. The measures employed shall be determined on a site-specific basis and subject to Agency approval.

RECOMMENDATION:

25. Borrow operations are to meet the same suspended sediment standards as any other pipeline-related activity (see "Suspended Sediment Standards").

RESPONSE:

Recommendation 25 is unacceptable since CAGSL does not recognize the "Suspended Sediments Standards".

ALTERNATIVE RECOMMENDATION:

25. Borrow operations as well as any other pipeline related activity will conform to a set of suspended sediment standards established mutually by the Agency and the Company.

Construction Services and Activities
Borrow Operations

RECOMMENDATION:

26. Dredging for borrow in the Mackenzie River may be permissible, under the following conditions:
- a) detailed site - and time - specific applications are submitted following the schedule proposed in Recommendation 19;
 - b) the Company must demonstrate that the proposed activity will not interfere with shipping, fishing or other traditional human activities;
 - c) the Company must show that the proposed activity does not disturb any sensitive area and does not take place at a sensitive time for fish;
 - d) disturbance of river bars and islands used by migrating waterfowl is prohibited (see "Birds"); and
 - e) dredging at, in or near the mouths of significant tributary rivers is prohibited.

RESPONSE:

Recommendations 26 (a) and (d) are unacceptable. In Recommendation 26 (e) the phrase "near the mouths" is not clearly defined in terms of distance.

ALTERNATIVE RECOMMENDATIONS:

- 26 b) The Company must demonstrate that the proposed activity will be scheduled to accommodate shipping, fishing or other traditional human activities.
- 26 c) The Company must show that the proposed activity does not unacceptably disturb any sensitive area and does not take place at a sensitive time for fish.

Construction Services and Activities
Borrow Operations

- 26 e) Dredging in the vicinity of significant tributary rivers
would only be undertaken with the approval of the agency.

RECOMMENDATION:

27. Concrete weights shall be made using the lowest grade of aggregate available that will produce concrete with the necessary properties.

RESPONSE:

Recommendation 27 is too restrictive.

ALTERNATIVE RECOMMENDATION:

27. Concrete weights shall be made using the lowest grade of aggregate available locally that will produce concrete with the necessary properties.

RECOMMENDATION:

28. Water required for concrete production shall be withdrawn in accordance with the standards recommended in "Water Supply and Intakes".

RESPONSE:

Acceptable.

Construction Services and Activities
Borrow Operations

RECOMMENDATION: (Page 16)

29. All wastewater, wash water and surface run-off from gravel processing, or weight casting operations and areas shall meet the standards as set out in "Suspended Sediment Standards".

RESPONSES:

Not acceptable because the "Suspended Sediment Standards" are insufficiently defined and Arctic Gas does not accept them as written.

ALTERNATIVE RECOMMENDATION:

29. All wastewater, wash water and surface run-off from gravel processing, or weight casting operations and areas shall meet a mutually acceptable set of standards.

RECOMMENDATION:

30. Every possible effort shall be made to avoid the spilling of cement, lime or related industrial or manufactured material. Any spills which do occur shall be cleaned up forthwith and the land rehabilitated or restored. Under no circumstances shall spills of cement, lime or related materials be permitted to enter any waterbody.

RESPONSE:

Acceptable.

Construction Services and Activities
Blasting

RECOMMENDATION:

1. The Company shall confine all blasting operations to areas sold, leased or otherwise appropriated to the Company for its use.

RESPONSE:

Acceptable.

RECOMMENDATION:

2. The Company shall limit and otherwise appropriately control its blasting activities at times and in areas important for wildlife. In particular the Company shall ensure that the following species and their habitats are protected:
 - a) Raptors: blasting activity within the Raptor Protection Zones during sensitive periods shall be prohibited except if specifically otherwise approved by the Agency (see "Rare and Endangered Species").
 - b) Waterfowl: blasting activity in areas habituated by nesting, moulting, staging etc. waterfowl shall be severely constrained to limit the disturbance to the birds so that their normal activities are not interrupted in any way (see "Birds").
 - c) White Whales: blasting shall not occur within one mile of marine or estuarine waters when such waters are being utilized by aggregations of migrating, calving or post-calving white (beluga) whales (see "Terrestrial and Aquatic Mammals").
 - d) Caribou: blasting shall be prohibited in any location that might disturb or alarm migrating, calving, post calving or any aggregation of caribou (see "Terrestrial and Aquatic Mammals").

Construction Services and Activities
Blasting

- e) Aquatic Furbearers: blasting in populated aquatic furbearer habitat should be avoided by utilizing all feasible alternatives. Where blasting must occur, the Company shall conduct its operation in a manner that assures the continued well-being of the furbearer population (see "Terrestrial and Aquatic Mammals").

RESPONSE:

This matter is covered specifically in the response to the Environmental Section of the Report. Recommendation 2 should therefore be omitted.

RECOMMENDATION:

- 3. In all locations where blasting is planned, the onus of proof that the operation will not cause short or long term harm for the fish and wildlife in the area, shall rest entirely with the Company.

RESPONSE:

Unacceptable.

ALTERNATIVE RECOMMENDATION:

- 3. In all locations where blasting is planned, the operation shall produce only the acceptable minimum short and long term harm for the fish and wildlife in the area. The Company shall provide an environmental impact statement for such activities when requested by the Agency.

Construction Services and Activities
Blasting

RECOMMENDATION:

4. The Company shall notify local people at least one month in advance of blasting operations in areas that are traditionally, currently or seasonally used by those people.

RESPONSE:

This recommendation is not adequate for the circumstances that will likely be encountered in many areas. There should be provision for an advance warning to local people regarding planned blasting operations in the areas which they traditionally use and there should be provision for an action or final warning which lets them know that blasting operations are about to commence. The advance warning in many instances, perhaps in most instances, could be at least one month in advance but there will be situations where the Company has not been able to ascertain that far in advance that blasting will be required.

ALTERNATIVE RECOMMENDATION:

4. Wherever possible the Company shall notify local people at least one month in advance of blasting operations in areas that are traditionally, currently or seasonally used by those people.
Where such notice is not possible, the Company shall notify local people as soon as possible. In addition, the Company shall provide notice to local people 48 hours to 72 hours in advance of actual blasting operations taking place.

Construction Services and Activities
Blasting

RECOMMENDATION:

5. Prior to approving construction activity in any area, the Agency should define the areas and probable times of sensitivity of wildlife and fish to blasting activity. During construction the actual locations and periods should be firmly established and updated blasting activity issued to the Company.

RESPONSE:

Acceptable.

RECOMMENDATION:

6. The Agency should prohibit any blasting activity in areas utilized by native people for hunting, trapping or fishing until those people have been advised of the activity and given the opportunity to harvest any wildlife that would be adversely affected.

RESPONSE:

Acceptable.

RECOMMENDATIONS

Overall Plan

1. Before final design and before any site-specific approvals are granted, the Company shall prepare an Overall Plan for the disposal of waste water and sewage from all construction activities and all permanent pipeline facilities over the life of the project up to and including abandonment. The Overall Plan shall be in graphic (map) form as far as possible, shall be presented by drainage basin or part thereof and shall be cognizant, by means of overlays or graphic presentations on the same scale or notations on the same document, of the Overall Plans for "Water Supplies and Intakes", "Solid Wastes: Camps and Facilities", "Solid and Liquid Wastes: Construction/Industrial Activities", "Pipe Testing", "Snow Roads", "Spill Prevention and Control" etc.

Response: Unacceptable

The requirement for a graphic presentation is too specific at this stage. Agency will have opportunity to specify an appropriate form. The presentation "by drainage basin" is impractical. A more suitable way is by "spread year".

Alternative Recommendation

"Before final design and before any site-specific approvals are granted, the Company shall prepare an Overall Plan for the disposal of wastewater and sewage from all construction activities and all permanent pipeline facilities over the life of the project up to and including abandonment. The Overall Plan shall be in an appropriate form, shall be presented by spread year and shall be cognizant of the Overall Plans for "Water Supplies and Intakes", "Solid Wastes: Camps and Facilities", "Solid and Liquid Wastes: Construction/Industrial Activities", "Pipe Testing", "Snow Roads", "Spill Prevention and Control" etc.

2. The Overall Plan shall specify:
 - a) the points of generation and disposal of waste;
 - b) the proposed methods of collection, storage, treatment and disposal of all wastes;

- c) the anticipated volumes, chemical and biological characteristics, and periods of discharge of all waste;
- d) the general physical and biological characteristics and domestic and/or commercial utilization of the receiving environment;
- e) the source and disposal plan for any hazardous or toxic waste; and
- f) alternate sites and/or treatment methods that could be used if the proposed site has to be excluded for any reason during the life of the proposed activity.

Response: 2(a) through (e) Acceptable

Response: 2(f) Unacceptable

This approach could create a lot of unnecessary work. It is anticipated that in most cases the prime alternative will be approved and the submission of other alternatives unnecessary.

Alternative Recommendation

If any of the proposed sites and/or treatment methods are unacceptable the Agency may request that the Company submit an alternative for review and approval.

Site-Specific Application

3. A separate site-specific application must be filed with the Agency for each wastewater or sewage disposal discharge regardless of the quality, rate or duration of the discharge except a group application may be permitted where two or more disposal sites are in the same watershed, will be used during overlapping periods and will result in similar treatment methods and effluent standards.

Response: Unacceptable

These applications would be much more manageable administratively if handled on a "spread year" basis.

Alternative Recommendation

Site specific applications must be filed with the Agency for each wastewater and sewage disposal discharge regardless of the quality, rate or duration of the discharge. Such application shall be filed for each "spread year" except where they are unrelated to a specific spread locations. In this event they shall be filed on an individual basis.

4. Each application to a discharge wastewater or sewage shall be keyed to the Overall Plan.

Response: Acceptable

5. Each application shall specify in detail:

- a) a normal and maximum population of the facility from which the waste will be generated;
- b) the complete design parameters for the proposed facility for disposition of waste including a documented estimate of the quantity of waste and its chemical, physical and biological characteristics;
- c) the design and operating considerations for handling upset conditions such as surge flows, hydraulic overloading, equipment failures, biological process collapse, etc.; and
- d) the particular characteristics of the receiving environment, including its utilization by wildlife, fish, hunters, trappers or any other people for recreational, professional or any other reason, that were used by the Company in assessing the degree of treatment required and acceptability of the particular discharge site.
- e) the proposed methods and times for monitoring of receiving waters.

Response: Acceptable

6. In the application the Company shall demonstrate, by presenting operational data of that system operating in comparable environmental situations, that the proposed wastewater treatment facility will perform to the standards specified.

Response: Unacceptable

There are very few systems working in the Arctic which will provide comparable experience. The most appropriate experience will be used with adjustments as deemed necessary to accommodate the particular environment.

7. Applications that are approved shall be valid only for the quantities, qualities, locations and periods of discharge specified in the approved application. If the forementioned are altered in any way that increase or relocate the impact of the discharge, the Company shall submit an amended application for approval before any such change occurs.
8. In all circumstances the burden of proof for demonstrating the effect of a discharge of any wastewater or sewage to the environment shall rest with the Company.

Response: Unacceptable

Submit that it is impossible to prove "before the fact", as this clause suggests that equipment will always function as designed or that designs will always be adequate. Malfunctions and miscalculations can occur even with the best of care. It is appropriate that timely steps be taken to correct any problems before serious damage occurs. This is covered in other sections.

Alternative Recommendation

"In all circumstances the Company shall supply to the Agency all information as required and requested regarding the effect of a discharge of any wastewater or sewage to the environment".

Effluent Standards

9. The degree of wastewater and sewage treatment shall be suited to the assimilative capability of the designated receiving environment.

The Company shall demonstrate that the effluent in the quantities and treated qualities proposed will not endanger public health and that it can be sustained by the receiving environment without adverse alteration of any current use by people, fish, birds or mammals. (see Recommendations 46 and 47 below).

Response: Unacceptable

The meaning of "demonstrate" is not clear and might be unnecessarily burdensome.

Alternative Recommendation

The degree of wastewater and sewage treatment shall be suited to the assimilative capability of the designated receiving environment. The effluent in the quantities and treated qualities shall not endanger public health and shall be sustainable by the receiving environment without adverse alteration of any current use by people, fish, birds or mammals. (see Recommendations 46 and 47 below).

10. Unless otherwise approved by the Agency, the general effluent standard shall be as specified in Section 4 of Environment Canada's "Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments" (1976). Under no circumstances will percent reduction of BOD, suspended solids etc. be accepted as a standard for secondary treatment.

Response: Acceptable with addition proposed

Alternative Recommendation -Add

"The DOE guidelines shall be treated as a general standard to be modified as suitable on a site specific basis".

11. The minimum effluent standard for all locations shall be primary treatment. The primary treatment shall separate the liquid and solid fractions of the influent and shall be free of debris, scum or other materials that produce colour, turbidity, taste or odour in concentrations which create a nuisance or adversely affect people, aquatic life or wildlife that utilize the receiving environment.

Response: Unacceptable

"Primary treatment" is not a standard to achieve the degree of treatment referred to, particularly as to taste or odour, would not be feasible.

12. The discharge of an effluent without adequate disinfection shall be permitted only where it is proved beyond reasonable doubt that there is not threat to public health.

Response: Acceptable

13. The use of chlorine as a disinfectant is discouraged but where it is to be used the Company shall demonstrate that the chlorinated effluent is not toxic to aquatic organisms.

Response: Acceptable

14. Effluent sampling and analytical procedures shall be in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association, et al.

Response: Acceptable

15. During construction, composite samples of the effluent shall be obtained and analyzed daily for COD and for 5 day BOD and suspended solids to ensure that the specified standards are not being violated. Weekly samples shall be assessed by an approved independent laboratory with the results incorporated into the plant records.

Response: Unacceptable

The frequency of test specified may not be appropriate in many circumstances. Also the need for an independent laboratory is questionable.

Alternative Recommendation

"During periods of discharge of effluent, composite samples shall be obtained and analyzed, as required, by the Agency, to ensure that the specified standards are not being violated. Samples shall be analyzed and assessed by personnel approved by the Agency, and the results shall be incorporated into the plant records.

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

16. During normal pipeline operations after construction, effluent samples and tests as noted above shall be taken weekly at all locations where there are staff on a permanent or temporary basis and tests by an independent laboratory shall be done once every thirty days of cumulative occupancy by operating personnel.

Response: Covered by rewording of number 15.

Alternative Recommendation - Delete

17. The Company shall conduct additional effluent tests, such as fecal coliform, chlorine residual (where chlorine is used as a disinfectant in the effluent stream), nutrients, TOC, etc. as may be required by the Agency or to verify the impact on the receiving environment. (See "Monitoring the Aquatic Environment").

Response: Acceptable

18. Where an effluent stream is discharged directly or indirectly into an identifiable watercourse the Company shall sample the watercourse up- and downstream of the discharge point whenever effluent is being discharged. The samples shall be taken at the same time as the effluent samples and shall be analyzed for BOD 5, suspended solids, total coliforms, chlorine residual and other parameters as may be required. The results shall be incorporated into the plant records. Sampling points shall be as outlined in Section on sediment or as otherwise directed by the Agency.

Response: Unacceptable

Under the definition of "an identifiable watercourse" (see section on Crossings: Definitions) this clause is impractical.

Alternative Recommendation

Change " an identifiable watercourse" to read "any stream".

19. For both composite and grab samples, 80% of a statistically reliable number of samples (minimum 5 samples) in any consecutive 30-day period should not exceed the limits specified, nor should any single sample exceed 5 times the specified limit. If these specifications are not met, the treatment system shall be declared "deficient" and the Company shall immediately decrease the population of the camp or facility until the treated effluent complies with the specified standards and is reclassified as "sufficient" by the Agency.

Response: Unacceptable

To immediately decrease population of the camp is unrealistic and unnecessary for acceptable protection of the environment.

Alternative Recommendation

"For both composite and grab samples, 80% of a statistically reliable number of samples (minimum 5 samples) in any consecutive 30-day period should not exceed the limits specified, nor should any single sample exceed 5 times the specified limit. If these specifications are not met, the treatment system shall be declared "deficient" and the Company shall take timely corrective action acceptable to the Agency".

20. Adequate records and operational reports of the wastewater treatment operation shall be maintained on site in a form approved by the Agency and shall indicate raw waste characteristics, waste volumes treated, chemicals used, sludge volumes produced and their final deposition, effluent quality, maintenance done and receiving environment characteristics. During pipeline construction a copy of all records, duly certified by the operator and camp superintendent shall be forwarded to the Agency at the end of each month. During operation the records shall be made available to the government upon request.

Response: Acceptable

Receiving Environment

21. Treated effluent shall not be discharged directly into streams or lakes unless the Company demonstrates that disposal on land or into swamps, bogs or fens is not viable.

Response: Acceptable

22. Treated effluent disposal into swamps, bogs, fens etc. shall be preferred in those areas that have sub-pools with flow throughout the year.

Response: Acceptable

23. Unless otherwise demonstrated, the swampland shall not be used for treated effluent disposal for more than 5 years and shall be of sufficient size to permit approximately 120 square yards per

Response: Acceptable

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

24. Wastewater disposal shall not contaminate groundwater.

Response: Acceptable

25. The wastewater effluent shall only be discharged to a receiving environment which can assimilate the residual pollutants. Particular attention shall be given to the protection of waterbodies from excessive organic loading during ice cover and low water level periods and to discharges to waterbodies that are quiescent or can become thermally stratified thereby causing localized concentrations of effluent.

Response: Acceptable

Construction Services and Activities
Wastewater, Sewage: Camps, etc.

26. Unless otherwise noted by the Agency, any effluent disposal that causes deviations from these standards shall be supported in the application by site-specific information and information available from Environment Canada's Water Quality Data Report - "NAQUADAT".

Response:

Cannot comment because not familiar with referenced report.

27. All solids and sludges in, or resulting from, the treatment of wastewater or sewage shall be handled in accordance with the requirements as detailed in "Solid Wastes: Camps and Facilities".

Response:

Acceptable subject to the proviso that the proposed revisions to applicable sections of "Solid Wastes: Camps and Facilities" are accepted.

Qualified Operator

28. A qualified operator for the wastewater and sewage operations shall be on site:
- (a) at all times for construction and related operations that exceed 200 man days at one location;
 - (b) one day a week with a minimum of two visits per site for construction and related operations that are less than 200 man days at one location; and
 - (c) as required at permanent facilities on the operating pipeline to perform normal maintenance and repairs except that there shall be a minimum of two visits a year (one of which shall be in winter) or once every 200 occupied man days.

Response: Unacceptable.

Basis for determining when a qualified operator will be required is impractical. This should be left for determination by the Agency. There will be widely varying circumstances.

Alternative Recommendation

A qualified operator or other designated individual shall attend all wastewater and sewage operations at

Construction Services and Activities
Wastewater, Sewage: Camps, etc.

such times as required by the Agency. The qualifications of such operator or individual shall be as approved by the Agency.

29. A qualified operator shall be an individual who has successfully completed a training program approved by the Agency, and who has a demonstrated knowledge of:
- (a) wastewater treatment processes with the ability to deal with "upset" conditions, start up, surges etc.
 - (b) wastewater sampling procedures;
 - (c) wastewater tests such as BOD, COD, suspended solids, pH, dissolved oxygen, chlorine residual etc.;
 - (d) interpretation and application of laboratory results;
 - (e) equipment operation, basic repair and preventive maintenance;
 - (f) basic public health practices; and
 - (g) safety.

Alternative Recommendation

Delete - covered by 28.

30. At locations where a qualified operator is not required full time (see recommendation 28b), one individual shall be designated to assure the safe and proper functioning of all wastewater and sewage systems.

Alternative Recommendation

Delete - covered by 28.

31. The designated individual at locations where a qualified operator is not required full time shall have a demonstrated knowledge of:
- (a) wastewater sampling procedures;
 - (b) steps to be taken to deal with "upset" conditions, start up, surges, etc.;

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

- (c) equipment operation, basic repair and preventive maintenance;
- (d) basic public health practices; and
- (e) safety.

Alternative Recommendation

Delete - covered by 28.

Design Considerations

32. All wastewater and sewage shall be collected and treated prior to disposal in accordance with detailed site-specific plans prepared by the Company, signed and sealed by a professional engineer and approved by the Agency.

Response: Acceptable.

33. Each wastewater and sewage treatment systems shall be designed to handle the maximum possible peak flows and surges plus 20% to minimize the chances of hydraulic overloading of the system. The use of flow equalization systems shall be considered mandatory for all mechanical treatment plants. Continuously recording flow meters shall be included at the effluent ends of all treatment facilities. Biological treatment plants at facilities that experience a wide variation in population should use parallel treatment plants to allow organic and hydraulic loading to be within the acceptable range for optimum treatment.

Response: Acceptable.

34. All treatment facilities shall include a laboratory fully equipped to make the necessary tests of the wastewater and sewage stream.

Response: Unacceptable.

This is an excessive requirement considering the variety of circumstances which will be encountered.

Alternative Recommendation:

The Company shall perform such tests as required and in such a manner as approved by the Agency.

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

35. All continuous flow wastewater treatment facilities which are dependent upon the operation of mechanical equipment shall have temporary emergency storage facilities with sufficient capacity for 10 days' flow of untreated effluent. Pump facilities to return the stored waste to treatment works shall be provided.

Response:

This recommendation is unclear and very difficult to determine true intent. It sounds very unreasonable and extreme.

Alternative Recommendation:

Delete.

36. Duplicate equipment shall be stocked on site for all pumps, valves and aeration equipment essential to the operation of the wastewater treatment and disposal system.

Response: Unacceptable.

No purpose is served by stocking these items at every site.

Alternative Recommendation:

Sufficient spare parts and equipment shall be stocked in appropriate locations to provide for timely maintenance of wastewater treatment and disposal systems.

37. All domestic water and sewage systems used in camps or in permanent facilities shall incorporate practices and hardware to minimize the use of water and hence reduce the volume of wastewater produced. This will be particularly important in areas which are environmentally sensitive or sacrosanct and in locations without abundant water.

Response:

Agree in principle but requirement to use such devices may not be practical in all cases.

Alternative Recommendation:

All domestic water and sewage systems used in camps or in permanent facilities shall be evaluated to incorporate systems which reduce the use of water to acceptable minimum.

Lagoons

38. Lagoons, used as a method of wastewater and sewage treatment, shall be designed for a minimum retention period of one year under the worst case of ice cover, infiltrated water conditions and maximum population plus 20% to account for unforeseen variations and thus assure, as much as possible, that hydraulic overloading will not occur. The Company shall limit discharge from lagoons during critical (ice cover) periods of the year to assure compliance with receiving water quality criteria.

Response: Acceptable.

39. Lagoons shall include a separate primary cell. The sludge shall be cleaned out regularly and disposed of as described in "Solid Wastes: Camps and Facilities".

Response: Acceptable subject to the proviso that the proposed revisions to applicable sections of "Solid Wastes: Camps and Facilities" are accepted.

40. All plans for sewage lagoons shall be accompanied by detailed, site-specific geotechnical and thermal analyses. The materials to be used for waste impounding embankments, their source and permeability shall be specified along with their stability. Seepage control measures shall be detailed.

Response: Acceptable.

41. The use of natural waterbodies as lagoons shall not be permitted unless the Company can demonstrate the site-specific benefits of such a practice.

Response: Acceptable.

42. Unless otherwise approved by the Agency, sewage lagoons shall not be located within 1000 feet of any waterbody supporting fish, used as a water supply source or utilized by local people for hunting, trapping, fishing or recreational purposes.

Response: Unacceptable.

The 1000 foot limit could be too restrictive in many circumstances.

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

Alternative Recommendation:

The proximity of waterbodies supporting fish, used as a water supply source, or utilized by local people for hunting, trapping, fishing or recreational purposes shall be taken into consideration when locating sewage lagoons. All locations shall be as approved by the Agency.

43. The Company shall submit for approval, at the time of submissions for initial authorization of the work, specific details of the measure that will be taken when abandoning each lagoon or wastewater retention pit. Upon termination of use, lagoon storage facilities shall be maintained for a minimum of one year or until the water quality is sufficiently recovered to allow discharge of the total contents to the receiving environment. The lagoon area shall be restored to provide a topography compatible with the surrounding terrain, and revegetated. Abandoned lagoons shall be posted.

Response: Acceptable.

Industrial waste to sewers

44. Wastewaters and sewage from industrial operations shall only be discharged to sanitary sewers if they do not interfere with the treatment process and provided they comply with the following guidelines:
- (a) the industrial waste discharge temperature shall not disrupt the treatment process or receiving environment;
 - (b) the industrial waste flow shall not exceed twice the average daily design flow;
 - (c) the pH of the industrial waste shall be 5.5 to 9.5;
 - (d) organic and other industrial waste concentrations shall not overload the treatment system;
 - (e) the limits of toxic materials discharged to sanitary sewers shall be:

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

Cyanide as HCN	2mg/litre
Chromium as Cr:	3mg/litre
Lead as Pb:	3mg/litre
Zinc as Zn:	3mg/litre
Copper as Cu:	3mg/litre
Nickel as Ni:	3mg/litre
Cadium as Cd:	3mg/litre
Phenolic compounds:	1mg/litre
Mercury:	.005mg/litre

Pre-treatment to remove these materials to this level will result in sludges the disposal of which must be detailed and approved by the Agency; hazardous material disposal;

- (f) flammable or explosive materials shall not be discharged to sanitary sewer systems but shall be contained and treated as hazardous materials;
- (g) animal or vegetable fats or oils shall be limited to 150 mg/litre; mineral oil effluent levels shall not exceed 15 mg/litre;
- (h) substances emitting hazardous or noxious gases such as hydrogen sulphide, carbon monoxide or ammonia shall not be discharged to the sanitary system;
- (i) wastes containing dissolved salts in excess of 1500 mg/litre shall be pretreated prior to discharge; and
- (j) the discharge of radioactive materials to sanitary sewer systems shall be prohibited; these materials shall be disposed of according to the regulations promulgated under the Atomic Energy Control Act RSC 1952.

Response

Unable to see the relevance of this recommendation to construction and operation of a pipeline system.

Alternative Recommendation:

Delete.

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

45. Industrial effluents shall not be diluted to comply with the above maximum levels.

Same as 44.

RECOMMENDATIONS: THE AGENCY

46. The Agency should review the applicability to this project of the "Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments" (DOE) and issue revised general standards to guide the Company. Such guidelines should be issued at the earliest possible date and before receipt of the Company's Overall Plan.

Response: Acceptable.

47. The Agency should adopt at the earliest possible date a comprehensive list of receiving water quality criteria for wastewater and sewage disposal purposes based on the recommendations as outlined in "Water Quality".

Response: Acceptable.

48. The Agency should approve in principle the Overall Plan for wastewater and sewage disposal and the Overall Plans for water supply, industrial waste and solid waste disposal before considering any site-specific submissions for approval.

Response: Acceptable.

49. Site-specific plans for each location where wastewater or sewage are to be disposed of should be approved by the Agency before allowing the Company to commence any on-site construction of the camp or permanent facility.

Response: Acceptable.

50. Approval by the Agency of site-specific plans for methods of disposal of wastewater and sewage should be conditional on a final on-site inspection approval of any facility. No discharge of any wastewater or sewage shall be permitted before such a final on-site inspection.

Response: Unacceptable.

Agree in principle but provision for run in period must be made.

Construction Services and Activities
Wastewater, Sewage: Camps, Etc.

Alternative Recommendation

Substitute for last sentence:

"The timing of such inspection shall be as specified
by the Agency."

51. The Agency shall assure that all effluents are treated at least to primary treatment standards and as otherwise may be necessary, on a site-specific basis, to protect public health and to suit the particular receiving environment.

Response: Acceptable.

Construction Services and Activities
Solid Wastes: Camps Etc

RECOMMENDATION:

1. Before final design and before site-specific approvals are granted, the Company shall prepare an Overall Plan for solid waste as specified in sections 1 and 2 of Wastewater and Sewage.

RESPONSE:

Acceptable subject to the proviso that the proposed revisions to applicable sections of Wastewater and Sewage are accepted.

RECOMMENDATION:

2. A separate application must be filed with the government for solid waste disposal for each construction spread and each camp or facility that has an annual manpower requirement of 200 man days or more. Application for camps or facilities with manpower requirements of less than 200 man days may be grouped provided the activities for each are within the same three month period.

RESPONSE:

Not acceptable. Should be done on "spread year basis" 200 manday limit is not practical.

Construction Services and Activities
Solid Wastes: Camps Etc

ALTERNATIVE RECOMMENDATION:

Site specific applications shall be filed with the Agency for all solid waste disposal sites required for each construction spread year. Where activities are not related to specific spreads, they shall be applied for on an individual basis.

RECOMMENDATION:

3. Each application shall be keyed to the Overall Plan.

RESPONSE:

Acceptable.

RECOMMENDATION:

4. Each application shall include the details as outlined under Wastewater and Sewage (section 5) and each application shall apply only as noted therein (section 6). Also, applications for disposal sites shall include an evaluation of topography, soils, substrata, ground and surface water conditions, high water level of nearby streams, availability of fill material and rehabilitation measures to be used upon abandonment.

RESPONSE:

Acceptable subject to the proviso that proposed revisions to applicable sections of Wastewater and Sewage are accepted.

Construction Services and Activities
Solid Wastes: Camps Etc

RECOMMENDATION:

5. In all circumstances, the burden of proof for demonstrating the effect of disposal of a solid waste shall rest with the Company.

RESPONSE:

Not acceptable.

ALTERNATIVE RECOMMENDATION:

In all circumstances the Company shall supply to the Agency all information as required and requested regarding the effect of solid waste disposal.

RECOMMENDATION:

6. The Company shall designate a responsible individual fully conversant in all aspects of solid waste practices and operation of related equipment at each location of activity and shall designate sufficient staff and equipment to implement the approved solid waste management plans.

RESPONSE:

Not acceptable. Definition of "fully conversant" gives problems as does the need for people "at each location".

Construction Services and Activities
Solid Wastes: Camps Etc

ALTERNATIVE RECOMMENDATION:

The Company shall designate responsible individuals with qualifications suitable to the Agency to manage the solid waste disposal activities. Men and equipment to implement plans shall be assigned to the satisfaction of the Agency.

RECOMMENDATION:

7. The Company shall adhere to the "Code of Good Practice for Handling Solid Wastes at Federal Establishments" as published by Environment Canada unless it is demonstrated to the Agency that other practices are preferable.

RESPONSE:

Acceptable.

RECOMMENDATION:

8. All domestic solid waste from meals or other activities along the right-of-way or elsewhere away from the designated camp or permanent facility shall be incinerated immediately on location or stored in tight fitting animal proof containers for shipment to the nearest approved disposal facility within 12 hours or at the end of a work shift, whichever is sooner.

RESPONSE:

Not acceptable. The 12 hour period is unreasonably short.

Construction Services and Activities
Solid Wastes: Camps Etc

ALTERNATIVE RECOMMENDATION:

Change "within 12 hours or at the end of the work shift, whichever is sooner" to "daily".

RECOMMENDATION:

9. Sewage sludges and sludges resulting from the treatment of water shall be handled according to methods developed by the Company and approved by the Agency at each location. (See Recommendation 14 below).

RESPONSE:

Acceptable.

RECOMMENDATION:

10. Scrap metal, oil drums, discarded equipment and other metallic and non-flammable waste shall be stored temporarily in designated areas. Volume shall be reduced by compaction, and the material shall be transported to previously designated and approved disposal or storage sites unless the Company can demonstrate that other methods of handling are preferable.

RESPONSE:

Acceptable.

RECOMMENDATION:

11. All combustible waste shall be incinerated in an approved incinerator unless the Company can demonstrate, on a site-specific basis, that other means of disposing of the waste are preferable.

RESPONSE:

Acceptable.

Construction Services and Activities
Solid Wastes: Camps Etc

RECOMMENDATION:

12. Open burning shall be prohibited except with prior written authorization of the Agency.

RESPONSE:

Acceptable.

RECOMMENDATION:

13. Emissions from incinerators shall meet all the requirements as outlined in "Air Pollution Emissions and Control Technology, Packaged Incinerators" (McColgan, I.J., 1976).

RESPONSE:

No response.

RECOMMENDATION:

14. Sewage sludge from treatment plants shall be dewatered and incinerated unless the Company can demonstrate, on a site-specific basis, that other means of disposal of the waste are preferable.

RESPONSE:

Acceptable.

Construction Services and Activities
Solid Wastes: Camps Etc

RECOMMENDATION:

15. Solid waste disposal sites shall be located at least 1000 feet from watercourses, human settlements or camp sites and shall be situated to avoid contamination of any stream, lake or groundwater system.

RESPONSE:

Not acceptable. The 1000 foot limitation can be unreasonable in many cases. Should be examined on site-specific basis.

ALTERNATIVE RECOMMENDATION:

The selection of solid waste disposal sites shall take into consideration the proximity of watercourses, human settlements and camp sites and shall be at locations approved by the Agency.

RECOMMENDATION:

16. Solid waste disposal sites shall be in accordance with the "Code of Good Practice on Dump Closing or Conversion to Sanitary Landfill at Federal Establishments" as published by Environment Canada, unless the Company can demonstrate that other practices are preferable.

RESPONSE:

Acceptable.

Construction Services and Activities
Solid Wastes: Camps Etc

RECOMMENDATION:

17. Borrow pits to be used as solid waste disposal sites shall be so designated on the application to use the borrow pit materials.

RESPONSE:

Acceptable.

RECOMMENDATION:

18. Hazardous or toxic wastes, such as solvents, oils, lubricants, greases or radioactive wastes, shall be excluded from normal landfill operation unless specifically approved by the government. (See also "Solid and Liquid Wastes: Construction/Industrial Activities.")

RESPONSE:

Acceptable.

RECOMMENDATION:

19. Storage areas and disposal sites shall be adequately fenced to prevent access by scavengers such as bears, foxes, wolves and wolverines, and to contain wind blown rubbish.

RESPONSE:

Not acceptable. Do not believe fences serve a practical purpose for these sites. Will not exclude bears, birds, etc. No materials that would attract animals should be dumped on these sites.

ALTERNATIVE RECOMMENDATION:

Delete.

Construction Services and Activities
Solid Wastes: Camps Etc

RECOMMENDATION:

20. Upon completion of disposal operation at a particular site the Company shall revegetate and grade the area to suit the local natural topography and drainage characteristics and shall post permanent signs that indicate the extent of the abandoned site and its dates of use.

RESPONSE:

Acceptable.

Construction Services and Activities

Solid and Liquid Wastes: Construction/Industrial Activities

RECOMMENDATION:

1. As part of final design and before final approval is granted, the Company shall prepare an Overall Plan for the handling and disposal of construction and industrial solid and liquid wastes (as specified in "Wastewater and Sewage", recommendations 1 and 2).

RESPONSE:

Acceptable subject to proviso that proposed revisions of the applicable sections of "Wastewater and Sewage" are accepted.

RECOMMENDATION:

2. An application for disposal of construction and industrial solid and liquid wastes shall be submitted with the application for solid waste disposal at camps and facilities.

RESPONSE:

Acceptable.

RECOMMENDATION:

3. A separate plan for disposal of construction and industrial solid and liquid waste shall be prepared for each construction spread and shall be keyed to the Overall Plan.

RESPONSE:

Acceptable.

Construction Services and Activities
Wastes: Construction

RECOMMENDATION:

4. Each application shall include details as outlined in recommendation 5 "Solid Waste: Camps and Facilities", and shall apply as noted therein.

RESPONSE:

Acceptable.

RECOMMENDATION:

5. In all circumstances, the burden of proof for demonstrating the effect of a discharge of waste shall rest with the Company.

RESPONSE:

Not acceptable.

ALTERNATIVE RECOMMENDATION

In all circumstances the Company shall supply to the Agency all information as required and requested regarding the effect of a discharge of waste.

RECOMMENDATION:

6. Hazardous and toxic wastes, X-ray wastes, radioactive wastes, etc. shall be listed in the site-specific application and shall be specially highlight as such. Each application shall specify for all hazardous and toxic wastes associated with activities included in the application:

Construction Services and Activities

Wastes: Construction

6. a) the name, properties and use of each substance;
- b) the volume of waste;
- c) the toxicity data for each substance (if available);
- d) the proposed method of packaging, transporting, transforming and stowing of the waste; and
- e) the proposed method of disposal.

RESPONSE:

Acceptable.

RECOMMENDATION:

7. Substances used on the project shall be selected as much as practicable according to their least toxicity and persistence of their waste product in the living environment.

RESPONSE:

Acceptable.

RECOMMENDATION:

8. The Company shall designate waste management personnel as noted in "Solid Waste: Camps and Facilities".

RESPONSE:

Acceptable subject to the proviso that proposed revisions to the applicable sections of "Solid Waste: Camps and Facilities" are accepted.

Construction Services and Activities
Wastes: Construction

RECOMMENDATION:

9. The Company shall manage all solid waste as noted in "Solid Waste: Camps and Facilities", recommendations 7, 8, 9, and 10.

RESPONSE:

Acceptable subject to the proviso that proposed revisions to the applicable sections of "Solid Waste: Camps and Facilities" are accepted.

RECOMMENDATION:

10. All hazardous and toxic wastes associated with the project shall be handled in compliance with the "Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments" (EPS, Environment Canada).

RESPONSE:

Acceptable.

RECOMMENDATION:

11. Non combustible construction and industrial solid wastes such as scrap metal, discarded equipment etc. shall be stored temporarily in designated fenced areas and, if possible, reduced in volume by compaction.

RESPONSE:

Not acceptable.

Construction Services and Activities
Wastes: Construction

ALTERNATIVE RECOMMENDATION

Non combustible construction and industrial solid wastes such as scrap metal, discarded equipment etc. shall be stored temporarily in designated areas and, if practicable, reduced in volume by compaction.

RECOMMENDATION:

12. All combustible construction and industrial solid waste shall be incinerated as specified in "Solid Waste: Camps and Facilities" unless the Company demonstrates that other disposal methods are preferable.

RESPONSE:

Acceptable.

RECOMMENDATION:

13. Trees and shrubs rendered as waste from clearing or cutting shall be burned or chipped (see "Vegetation Clearing").

RESPONSE:

Acceptable.

RECOMMENDATION:

14. All non-combustible construction and industrial solid waste such as scrap metal, discarded equipment and parts, pieces of pipe etc. shall be transported to designated storage/disposal areas unless disposal by other means such as burial in worked out borrow pits is approved by the Agency.

RESPONSE:

Acceptable.

Construction Services and Activities
Wastes: Construction

RECOMMENDATION:

15. If a borrow pit is to be used as a disposal site for construction/industrial solid waste it shall be so designated in the initial application to use the borrow pit and shall be so approved by the Agency. (See "Borrow Operations").

RESPONSE:

Acceptable.

RECOMMENDATION:

16. Solid waste disposal sites shall be located and operated in accordance with the requirements of "Solid Waste: Camps and Facilities" (Recommendations 15 to 20).

RESPONSE:

Acceptable subject to the proviso that proposed revisions to applicable sections of "Solid Waste: Camps and Facilities" are accepted.

RECOMMENDATION:

17. All hazardous and toxic wastes shall be disposed of in a manner specifically approved by the Agency and in accordance with the "Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments".

RESPONSE:

Acceptable.

Construction Services and Activities
Wastes: Construction

RECOMMENDATION:

18. An undisturbed area of natural vegetation at least 300 feet in width shall be left between any disposal site containing waste soil or excavated material and any waterbody or any public right-of-way.

RESPONSE:

Not acceptable - 300 feet could be too restrictive in certain cases.
Should be left to discretion of the Agency.

RECOMMENDATION:

19. Waste soil, rock and other materials resulting from operations on the right-of-way shall not be disposed of in any waterbody, ice covered or otherwise, unless specifically approved by the Agency.

RESPONSE:

Acceptable.

RECOMMENDATION:

20. Construction wastes consisting of waste soil from the pipeline trench or other excavations, stumps and other excavated residue should be disposed of in designated borrow pits. Alternatively, soil may be disposed of by spreading over the right-of-way if the Company demonstrates that such a practice would not cause siltation of adjacent waterbodies, interfere with natural drainage, local vegetation or the right-of-way revegetation program.

RESPONSE:

Acceptable.

Construction Services and Activities
Wastes: Construction

RECOMMENDATION:

21. Spreading of waste excavated material on the right-of-way shall not be in layers greater than six inches and shall not be on slopes greater than three degrees.

RESPONSE:

Not acceptable. The selection of three degrees and six inches seems to be arbitrary. The type material and specific location need to be considered.

ALTERNATIVE RECOMMENDATION:

Spreading of waste excavated material on the right-of-way will be permitted provided it is done in locations and in a manner approved by the Agency.

RECOMMENDATION:

22. Small amounts of waste organic material from excavations may be spread out on cleared areas provided it is spread in layers not exceeding six inches and is covered with soil or otherwise rendered harmless as a fire hazard.

RESPONSE:

Not acceptable - too specific.

Construction Services and Activities
Wastes: Construction

ALTERNATIVE RECOMMENDATION:

Small amounts of waste organic material from excavations may be spread out on cleared areas provided it is spread in a manner which does not constitute a fire hazard.

RECOMMENDATION:

23. Where the amount of waste soil exceeds the capacity of the designated borrow pits and/or right-of-way, the waste soil may be disposed of in spoil mounds. Plans for disposal in spoil mounds shall be prepared by the Company on a site-specific basis, and shall include details on:
- a) the clearing and stripping of topsoil;
 - b) topography and drainage before and after the disposal occurs;
 - c) the nature of the substrata;
 - d) the properties of the soils or other excavated material to be disposed of at the site;
 - e) the height, side slopes and drainage features of the spoil mound; and
 - f) rehabilitative measures including grading and revegetation.

RESPONSE:

Acceptable.

RECOMMENDATION:

24. Disposal of thaw-unstable (ice rich) excavated material shall be completed before such material has deteriorated from its in-situ condition.

Construction Services and Activities
Wastes: Construction

RESPONSE:

Not acceptable. This could be very restrictive or impossible to comply with e.g. excavation at river crossings in the summer.

ALTERNATIVE RECOMMENDATION:

Disposal of thaw-unstable (ice rich) excavated material that is not used for backfill shall be disposed of in a manner approved by the Agency.

RECOMMENDATION:

25. Thaw-unstable excavated material shall be disposed of only in designated worked out borrow pits in a manner approved by the Agency. Disposal of such material shall be included in the borrow pit rehabilitation/revegetation scheme in such a way that it will remain stable.

RESPONSE:

Not acceptable - too restrictive.

ALTERNATIVE RECOMMENDATION:

Thaw-unstable excavated material shall be disposed of only in designated locations and in a manner approved by the Agency.

Construction Services and Activities
Water Supplies and Intakes

RECOMMENDATION:

1. Before final design and before site specific approvals are granted, the Company shall prepare a general Overall Plan for all water withdrawals (as specified in "Wastewater and Sewage: Camps and Facilities").

RESPONSE:

Acceptable subject to the proviso that proposed revisions to applicable sections of "Wastewater and Sewage: Camps and Facilities" are accepted.

RECOMMENDATION:

2. The Overall Plan shall specify:
 - a) the source of all waters;
 - b) the proposed method of withdrawal, means of transportation storage, treatment and use of the water;
 - c) the anticipated volume, rates and periods of withdrawal;
 - d) the general physical and biological characteristics and domestic and/or commercial utilization of the water source;

RESPONSE:

Acceptable.

RECOMMENDATION:

2. e) alternate sources that could be used if the proposed site is unacceptable to the Agency or if the proposed site has to be excluded for any reason during the proposed withdrawal period.

RESPONSE:

Not acceptable.

Construction Services and Activities
Water Supplies and Intakes

ALTERNATIVE RECOMMENDATION:

In the event that the proposed source is not acceptable to the Agency the Company shall at their request propose an alternate source for review and approval.

RECOMMENDATION:

3. A separate and site-specific application shall be filed by the Company for each water withdrawal regardless of its rate or duration except a group application shall be permitted where two or more withdrawals are from the same waterbody, occur during overlapping periods and are for similar volumes each of which is less than 5% of the minimum daily flow or total volume of the source.

RESPONSE:

Not acceptable.

ALTERNATIVE RECOMMENDATION:

Site-specific applications shall be filed by the Company for all water withdrawals on a spread year basis regardless of the rate or duration.

RECOMMENDATION:

4. Each application for water withdrawal shall be keyed to the Overall Plan and shall be submitted at least one year prior to the withdrawal if the withdrawal is for snow road construction, pipe testing or ditch flooding.

Construction Services and Activities
Water Supplies and Intakes

RESPONSE:

Not acceptable. The one year period is unreasonable and unworkable. It is not likely that sufficiently specific information would be available this far ahead of time.

ALTERNATIVE RECOMMENDATION:

Each application for water withdrawal shall be keyed to the Overall Plan and submitted at a time and in a manner required by the Agency.

RECOMMENDATION:

5. Each application shall comply with the requirements of the section on Fish and shall specify:
 - a) the source of the water and location of use;
 - b) the maximum rates of withdrawal and the total volume to be withdrawn or the volume per unit of time in the case of an ongoing withdrawal;
 - c) a statement justifying the need for water and the selection of the withdrawal site to meet this need;
 - d) the intake, transportation and treatment design details for the water withdrawal works;
 - e) the particular environmental and land use characteristics of the water supply source (including its use by fish, wildlife, trappers, fishermen or any other people for recreational, professional or any other reason) together with the Company's assessment of effects of the proposed withdrawal; and
 - f) the physical changes to the waterbody that will result from the withdrawal including:
 - (i) Watercourses: percent decrease in flow rate and water depth and water level. For winter withdrawal where fish or eggs are present downstream, change in depth and area of pools during minimum flow and maximum ice cover;

Construction Services and Activities
Water Supplies and Intakes

- (ii) Lakes: percent decrease in water volume and maximum water depth and water level, and time when water will recover its natural level.

RESPONSE:

Acceptable.

RECOMMENDATION:

6. Applications that are approved shall be valid only for the quantities, locations and periods of withdrawal specified in the approved application. If the aforementioned are altered in any way that would increase or change the location of the impact, the Company shall submit an amended application for approval before any such change occurs.

RESPONSE:

Acceptable.

RECOMMENDATION:

7. In all circumstances, the burden of proof for demonstrating the environmental effect of a water withdrawal shall rest with the Company.

RESPONSE:

Not acceptable.

ALTERNATIVE RECOMMENDATION:

In all circumstances the Company shall supply to the Agency all information as required and requested regarding the effect of water withdrawal on the environment.

Construction Services and Activities
Water Supplies and Intakes

RECOMMENDATION:

8. All water withdrawals shall be in accordance with site-specific plans prepared by the Company, signed and sealed by a professional engineer and approved by the government.

RESPONSE:

Acceptable.

RECOMMENDATION:

9. a) Water shall not be removed from a waterbody frequented by fish, waterfowl, or aquatic fur bearers unless the applicant has demonstrated that this water-use will not be detrimental to the fish, waterfowl, or aquatic fur bearer populations and resources in and around the waterbody, either at the time of removal or at other (subsequent) times. If the Company submits that a waterbody is not frequented by fish, etc., it is responsible for demonstrating the veracity of this submission.
- b) A water intake shall not be located within 200 yards of fish spawning or overwintering areas which have well-defined boundaries. Water removal from large watercourses having scattered overwintering and spawning areas shall be permitted if proper screening and approved velocities are maintained.

RESPONSE:

Acceptable.

Construction Services and Activities
Water Supplies and Intakes

RECOMMENDATION:

9. c) Water removal shall not exceed 10% of the minimum quantity of water in the waterbody during the period of removal. In any case, water shall not be removed from any lake containing fish unless it is deeper than 12 ft, or from any flowing waterway where removal would reduce velocity below 1.5 ft/sec. or depth below 6/10 ft. In all waterways containing fish, the flow rate shall be maintained at least at the median monthly minimum flow level during November - April. The monthly minimum flow calculation shall be the flow normally expected in streams and 9 out of 10 years during each of the winter months.

RESPONSE:

Not acceptable. These design parameters cause problems and need to be reviewed before being accepted.

ALTERNATIVE RECOMMENDATION:

None - should be left for review by the Agency.

RECOMMENDATION:

9. d) Water removal shall not cause siltation or turbidity in excess of standards set out in the section "Suspended Sediment Standards in Waterbodies".

RESPONSE:

Acceptable subject to the proviso that proposed revision of the applicable sections of "Suspended Sediment Standards in Waterbodies" are accepted.

Construction Services and Activities
Water Supplies and Intakes

RECOMMENDATION:

9. e) The intake structure shall be located and designed so that the maximum inlet velocity is 1 foot per second and so that the intake avoids interference with indigenous fish populations assuming a worst case situation for ice build-up on the screen and in the water source.

RESPONSE:

Not acceptable. This maximum velocity is not sufficient to inhibit ice build-up on the intake.

ALTERNATIVE RECOMMENDATION:

Same as 9. c).

RECOMMENDATION:

9. f) Stationary intakes shall conform to the specifications outlined in the Intake Screen Guidelines (1972) of the Fisheries and Marine Service (Vancouver), Environment Canada.

RESPONSE:

No comment.

RECOMMENDATION:

9. g) Movable intakes shall be assessed and approved on an individual basis but should meet specifications comparable to those for stationary intakes.

RESPONSE:

Acceptable.

Construction Services and Activities
Water Supplies and Intakes

RECOMMENDATION:

10. The design shall include measures that will be taken during use and upon abandonment to stabilize the affected approaches to the source so that creeping and erosion will not occur.

RESPONSE:

Acceptable.

RECOMMENDATION:

11. Where permanently submerged water withdrawal structures are utilized, the Company shall arrange an on-site inspection of the structure prior to its installation.

RESPONSE:

Acceptable.

RECOMMENDATION:

12. The Company shall design all water related systems for construction activities, camps or permanent facilities incorporating practices and hardware to minimize the use of water. This will be particularly important in areas that are ecologically sensitive or are without an abundant water supply.

RESPONSE:

Acceptable.

Construction Services and Activities
Water Supplies and Intakes

RECOMMENDATION:

13. A qualified individual for water withdrawal shall be at the water withdrawal site at all times during withdrawals of water used for industrial and related operations during pipeline construction and testing; (ie. pipe testing, ditch flooding, snow road construction).

RESPONSE:

Acceptable.

RECOMMENDATION:

14. A qualified individual for water withdrawal shall be a person who has been so designated by the Company and approved by the government and who has a demonstrated knowledge of:
- a) the critical biological features of the water supply source including the habitat features that must be protected and the presence and movement of fish;
 - b) the design and operation of the water withdrawal facility; and
 - c) safety.

RESPONSE:

Acceptable.

Construction Services and Activities
Water Supplies and Intakes

RECOMMENDATION:

15. The qualified individual for water withdrawal shall be given authority by the Company to stop all water withdrawals should it be asked to do so by the authorized officer on-site or should he deem it necessary to do so on the basis of his own judgment.

RESPONSE:

Acceptable.

RECOMMENDATION:

16. If an intake impairs fish habitat or movements, directly or indirectly, it shall be shut down and then redesigned or moved to a more suitable location that has been approved by the government.

RESPONSE:

Acceptable.

RECOMMENDATION:

17. If the minimum flow or depth in the watercourse or lake is approached during water withdrawal, the extraction of water shall cease until a safe water level is restored.

RESPONSE:

Not acceptable.

Construction Services and Activities
Water Supplies and Intakes

ALTERNATIVE RECOMMENDATION:

If the minimum flow or depth in the watercourse or lake is approached during water withdrawal, the rate of extraction of water shall be reduced until a safe water level is restored.

RECOMMENDATION:

18. Upon abandonment of a water withdrawal facility or where such a facility will not be used for one month or more, the Company shall remove the intake and all related equipment and structures from the water.

RESPONSE:

Not acceptable. The removal of intake after one month of disuse would probably create more problem than it would solve. Some facilities will undoubtedly be used intermittently.

ALTERNATIVE RECOMMENDATION:

Upon abandonment of a water withdrawal facility the Company shall remove the intake and all related equipment and structures from the water.

RECOMMENDATION:

19. Site specific plans for each water withdrawal site should be approved by the government prior to allowing the Company to commence any on-site construction activity.

RESPONSE:

Not acceptable.

Construction Services and Activities
Water Supplies and Intakes

ALTERNATIVE RECOMMENDATION:

Add words "of this facility" to end of sentence.

RECOMMENDATION:

20. Approval of site-specific plans by the Agency shall be conditional on a final on-site inspection approval of the water withdrawal facility. No water withdrawal should be permitted before such a final on-site inspection.

RESPONSE:

Acceptable.

RECOMMENDATION:

21. The Agency shall not approve any water withdrawal scheme unless the Company demonstrates that the water use and the associated works and activities will not adversely affect other uses of water for domestic or industrial purposes, transportation on or access to the waterbody, or trapping and fishing by local people.

RESPONSE:

Not acceptable.

ALTERNATIVE RECOMMENDATION:

In all circumstances the Company shall supply to the Agency all information as required and requested regarding the potential adverse effects of water withdrawals on other uses of water for domestic or industrial purposes, transportation on or access to the waterbody, or trapping and fishing by local people.

Construction Services and Activities
Pipe Testing

RECOMMENDATION:

1. In order to minimize the risks of pipe failure during field testing and the resulting problems associated with repair or replacement of any segment of the pipeline, the Company shall rigorously apply high standards of quality control during construction of the pipeline.

In particular, special attention shall be paid to the reliability of all welding and the testing of welds, to the pipe laying operation and to the backfilling operation, including the placement of any bedding and padding materials necessary.

RESPONSE:

Acceptable.

RECOMMENDATION:

2. The Company shall submit detailed plans for field pressure testing for the approbation of the Agency.

RESPONSE:

Acceptable.

RECOMMENDATION:

3. In addition to complying with the requirements of the Gas Pipeline Regulations (National Energy Board, 1974) and C.S.A. Standard Z184-1973, pipeline testing will only be carried out under a permit from and in the presence of a representative of the Agency. Each pipe test segment shall be covered by a separate application to the Agency, accompanied by:

Construction Services and Activities
Pipe Testing

- a) The location or locations at which each of the following operations are proposed, details of the equipment and procedures proposed to be used, of the quantities and temperatures of water and methanol involved, and of the dates and times of the proposed operations:
 - i) water withdrawal (also see "Water Supplies and Intakes"),
 - ii) any pretreatment of the water, nature of residue and plans for disposal of residue,
 - iii) the heating of water and the filling of the test section or sections,
 - iv) the mixing of methanol with the water and the filling of the test section or sections,
 - v) the storage of water or water-methanol solution in the pipe between tests or from one construction season until the next,
 - vi) the emptying of the test section, and
 - vii) the disposal procedures for the test medium.
- b) Details of site-specific contingency plans for each test section outlining methods of containment and recovery of spills of warm water, water-methanol or pure methanol, should the pipe or any associated equipment fail during testing, including methods of detection, notification, decision-making, containment, countermeasures, clean-up, disposal of warm water or water-methanol solutions and restoration, which adequately reflect concerns for vegetation, surface waters and wildlife habitats and which meet with the approval of the Agency, and including the specific locations of all catchment devices that will be built to keep spilled fluid out of waterbodies.
- c) A thorough biological and hydrological inventory of each site proposed for use during pipe testing procedures, together with an environmental impact report of the operations proposed, and including a discussion of the seasonal implications of the operation.
- d) Any other information required by the Agency.

Construction Services and Activities
Pipe Testing

RESPONSE:

The manner in which pressure tests are to be conducted have for a long time been the subject of regulations enforced by the National Energy Board. This pipeline should not create need for regulations that are materially different from what we have seen in the past with the exception of possible spillage and the disposal of the methanol water mixture. The suggestion that we should make a separate application for each test segment is burdensome and would create a great problem in terms of the timing. There is, of course, a complete record filed on each test section. Application on spread season basis is more reasonable.

3. a) Acceptable.
3. b) Not acceptable. Contingency plans on a site specific basis are unrealistic in this case. Location of failures cannot be predetermined.

RECOMMENDED ALTERNATIVE:

Details of contingency plans for each spread year outlining methods of containment and recovery of spills of warm water, water-methanol or pure methanol, should the pipe or any associated equipment fail during testing, including methods of detection, notification, decision-making, containment, countermeasures, clean-up, disposal of warm water or water-methanol solutions and restoration, which adequately reflect concerns for vegetation, surface waters and wildlife habitats and which meet with the approval of the Agency, and including methods of deployment of catchment devices intended for the purpose of keeping spilled fluid out of waterbodies.

Construction Services and Activities
Pipe Testing

3. c) Not acceptable. To prepare this on a specific site basis is unnecessarily onerous.

RECOMMENDED ALTERNATIVE:

Each spread year section shall be assessed to identify areas particularly sensitive to test fluid spills. For each of these areas a biological and hydrological inventory shall be prepared, together with an environmental impact report of the operations proposed, and including a discussion of the seasonal implications of the operation.

3. d) Acceptable.

RECOMMENDATION:

4. Repair or replacement of any segment of pipe shall comply with the recommendations set out in the section on "Emergency Repairs to the Pipeline and Right-of-Way".

RESPONSE:

Not acceptable. Repair of test failure has substantially different implications than repairs during operation.

ALTERNATIVE RECOMMENDATION:

The Company shall submit to the Agency for approval plans for location and repair of failures during pressure testing.

Construction Services and Activities
Pipe Testing

RECOMMENDATION:

5. The Company shall not use machinery or otherwise conduct the testing operation so as to harass or unnecessarily disturb or damage fish or wildlife or their habitat.

RESPONSE:

Acceptable.

RECOMMENDATION:

6. Water withdrawal for pipeline testing shall comply with the recommendations contained in "Fish Protection" and "Water Supply and Intakes".

RESPONSE:

Acceptable subject to the proviso that proposed revisions to the applicable sections of "Fish Protection" and "Water Supply and Intakes" are accepted.

RECOMMENDATION:

7. The test liquid effluent must meet effluent criteria outlined in "Wastewater and Sewage: Camps and Facilities" and "Solid and Liquid Wastes: Construction/Industrial Activities". The treated effluent must also meet the criteria outlined in "Water Quality".

Construction Services and Activities
Pipe Testing

- a) diluted to a 1% solution and metered into a flowing watercourse;
- b) stored in a lagoon until natural or mechanical processes have reduced the concentration to an acceptable level, and the resulting solution discharged directly into a flowing watercourse;
- c) diluted and sprayed in a controlled fashion onto a vegetated land surface, at a rate that will not exceed the assimilative capacity of the area; or
- d) diluted and sprayed in a controlled fashion onto a snow covered vegetated land surface or onto a large ice covered waterbody where sublimation, evaporation, dilution and biological degradation of the solutions are demonstrated to be within the assimilative capacity of the area. Spraying onto ice that is cracked, rotted or contains holes shall not be permitted.

RESPONSE:

Acceptable subject to the proviso that proposed revisions to the applicable sections of "Water Quality", "Wastewater and Sewage: Camps and Facilities" and "Solid and Liquid Wastes: Construction/Industrial Activities" are accepted.

RECOMMENDATION:

- 8. The Company shall dispose of all test liquids, including the water used to heat the pipeline by treating it to reduce concentrations of oils, organic carbon compounds and particulates to acceptable levels before discharge.

RESPONSE:

Not acceptable.

Construction Services and Activities
Pipe Testing

ALTERNATIVE RECOMMENDATION:

Where unacceptable concentrations of oils, organic carbon compounds and particulates are present in test liquids including the water used to heat the pipeline the Company shall treat such liquids to reduce those contaminants to acceptable levels.

RECOMMENDATION:

9. Where a methanol solution is disposed of by spraying onto land or ice covered water, the Company shall specify the method of controlled spraying, the rate of spraying, the total load to be applied per acre, and all the environmental and other information used by the Company in developing the proposal.

RESPONSE:

Acceptable.

RECOMMENDATION:

10. The Company shall store water-methanol test fluid from one construction season to the succeeding season in steel tanks or bladder tanks in accordance with the recommendations described in "Spill Prevention and Control". Test fluids stored in completed sections of pipeline shall only be stored in sections which have been successfully pressure tested and have been approved by the Agency for storage purposes.

RESPONSE:

Acceptable.

Construction Services and Activities

SPILL PREVENTION AND CONTROL

GENERAL COMMENTS

Arctic Gas is in general agreement with the principles and objectives underlying this section however some of the specific recommendations appear overly restrictive and would be cumbersome to administer. They agree that every reasonable precaution should be taken to prevent spills of contaminants into the environment and that any spills that do occur be handled as effectively and expeditiously as is practicable.

Measures taken should include proper design of all storage, transportation and handling facilities and equipment, instruction in safe handling, contingency plans for spills, proper equipment for containment and cleanup and proper training of personnel and management of cleanup activities.

The greatest potential for spills of contaminants is during the construction phase and results from handling of hydrocarbon fuels and methanol. The spill potential from other materials is small as is the potential for spills during operations.

During construction almost all large bulk handling will take place to and from barges during the summer. The single exception to this is the mixing of methanol-water solutions and the transfer to and from test sections.

Other handling will be in small lots.

Methanol during testing will be diluted and the spill potential during testing is minor since the probability of a test failure is low.

The sections on storage and handling include a number of acceptable proposals but others could create severe problems and still others require more study to determine the implications.

The marine transportation and transfer sections appear to have been designed for seaport operation and do not take into consideration the experience and special circumstances of the Mackenzie River barge operations.

Recommendations for control of land transfer operations have not given sufficient weight to the specific activities of pipeline construction and could create many problems.

Arctic Gas agrees in principle with the intent of the proposals on cleanup activities although the implementation and administration of the recommendations on the basis suggested could be cumbersome. This needs further study to relate it specifically to the form of construction organization proposed by the Company and the organization of the Agency.

Construction Services and Activities
Spill Prevention and Control

Quick settlement of damages is important but this section proposes several procedures which are fraught with complications.

The personnel training proposals are much too specific at this stage and need to be designed to be compatible with other training programs and with the particular construction organization.

In summary it is not possible to respond in detail to the recommendations of the section on Spill Prevention and Control without a great deal of further work which would need to involve the barge operators and would have to relate to the specific organization of the Company and the Agency.

RECOMMENDATION

That the recommendations of the Commission should only set forth basic principles and objectives and that the details should be subject to further study by the Agency, Company and barge operators.

Construction Services and Activities
Fire Control

GENERAL RECOMMENDATION:

The Company shall submit to the Agency plans for the prevention and control of fire during the construction and operation of the pipeline. These plans shall be developed in collaboration with the Yukon Forestry Service and the Northwest Lands and Forest Service and shall include information on employee education and training, fire reporting procedures, equipment type and placement, summer and winter fire prevention measures, equipment and employee mobilization, rehabilitation procedures to be implemented following a fire, and any other information the two Services may require.

RESPONSE:

Acceptable.

PROJECT REGULATION

- The Government
- The Company
- Enforcement
- Environ. & Social Training

PROJECT REGULATION - THE GOVERNMENT

RECOMMENDATION:

1. The government should proceed as quickly as possible to establish a single agency approach for regulation of the construction of the pipeline project, the gas plants and all related activities by bringing together under one management the multitude of jurisdictions and responsibilities spread throughout federal and territorial departments and agencies. For this project, the Agency should include the traditional construction regulation and control roles of the NEB.

RESPONSE:

Arctic Gas agrees with the concept of a single regulatory agency. Such agency should not have regulatory control of the gas plants and "all related activities".

Arctic Gas feels it necessary that the single regulatory agency direct its attention entirely to the pipeline project. This assignment is large and complex, and any detraction from the concentration on that task would be detrimental to the best interests of the Government and the pipeline. The procedures they put in place should be applicable only to the pipeline activity.

Rather than have the proven construction regulation and control functions of the National Energy Board included as part of the function of the single regulatory agency, Arctic Gas feels the N.E.B. should have its traditional jurisdiction of the technical, socio-economic and environmental factors of pipeline developments expanded where necessary so that it will be the single regulatory agency to administer all regulations and stipulations that apply to the pipeline project in the Northwest and Yukon Territories, as it is South of the 60th parallel.

ALTERNATIVE RECOMMENDATION:

1. The Government should expand as necessary the jurisdiction and responsibility of the National Energy Board in order that it may function as the single regulatory authority for the construction of the pipeline project.

RECOMMENDATION:

2. The single Agency should incorporate the environmental, social and local economic controls on the project on an equal footing with engineering controls. There should not be a dominant "decision" group and a subserviant "advisory" group. There should be social, economic, environmental and engineering considerations brought to bear at each stage of the Agency's control activities. This requires that all be housed at the same head office. It would erode the even handed control sought if, for example, those responsible for social controls were housed in a separate building, or worse, a separate city from the rest of the Agency.

RESPONSE:

Acceptable.

RECOMMENDATION:

3. To adequately discharge its mandate the Agency must, at a minimum, engage in the following activities:
 - a) Preliminary Design Review - this control function must be conducted at a sufficiently early stage that changes required by the Agency can be included by the companies affected in their contracts for materials and supplies. Such changes must of course be included in the applicable final designs. Furthermore, this design review stage is the appropriate and most effective point at which third party social and environmental interests should be brought to bear on the design, and at which changes prompted by these interests should be made. It is critical that the parties involved be prepared to participate in this design review process at this stage, and that they have access to sufficient funds to enable them to do so to their satisfaction. Finally, it is equally important that the participation of interested parties be continuous throughout all of the phases (b) - (d) outlined below, to ensure that the spirit as well as the letter of the preliminary design review conditions are met, and that any changes in design are consistent with the principles established in the granting of a right-of-way and confirmed during preliminary design review.
 - (b) Final Design Review - this control function follows the submission by the company of its final design. The changes which are required by the Agency lead to final design modifications.
 - (c) Notice to construct - this control function consists of an on-site permission to proceed once the Agency enforcement officer (that is, the Agency's representative in the field) is satisfied that final design specifications have been satisfied at the work site.
 - (d) Surveillance of construction activities - this is the traditional control function of inspection to ensure compliance with applicable regulations and stipulations. The enforcement techniques available to the Agency in discharging this task are discussed elsewhere in this submission.

RESPONSE:

Preliminary Design and Planning - The preliminary design will essentially identify line route, compression and measuring stations locations, river crossing locations and locations of wharfs, roads, airstrips, borrow sites and staging areas, in addition to the basic technical design criteria. It would be appropriate for native people and northerners to make input to this review function through the proposed Northern Advisory Board; however Arctic Gas does not propose to provide funds for these activities.

Final Design Review - The review of final facilities design is a function of the Agency. The Agency will be responsible to assure that all stipulations and regulations are complied with and should any significant changes be required which would have effect on native people and northerners the Agency would call attention of these parties, to the required change, through the Northern Advisory Board.

Leave to Construct - Leave to Construct should be granted by the Agency following its Final Design Review. Leave to Construct will be granted for manageable units of the project, e.g., a compressor station, a measurement station, a pipeline spread, a staging facility.

Surveillance of Construction Activities - The Agency should have the traditional role of assuring the adequacy of Arctic Gas' inspection operation.

ALTERNATIVE RECOMMENDATION

3. To adequately discharge its mandate, the Agency must engage in the following activities:
 - a) Preliminary Design Review - this function must be conducted at an early stage so that changes required by the Agency can be included by the Company and reflected in the Company's final design, construction plans and specifications. The preliminary design review stage is the appropriate point at which the social and environmental interests of native people and northerners should be introduced. Input during this stage will ensure that their interests are reflected in the final design and construction plans.

- b) Final Design Review this function will be accomplished as final design of the project segments is completed by the Company. Changes required by the Agency would result in final design modifications.
- c) Leave to Construct - this function will consist of the granting of leave to construct the project segments following final design review - b) above.
- d) Surveillance of Construction Activities - this is the traditional function of the regulatory agency to assure the adequacy of the Company's inspection procedures.

RECOMMENDATION:

- 4. The Agency must provide for an appeal procedure from any Agency decision yielded by any of the four control procedures set out in paragraph 3 above. The final forum for appeal of such decisions shall be the head of the Agency.

RESPONSE:

Arctic Gas agrees that an appeal procedure should be established for decision emanating from control procedures set out in Recommendation 3, but does not agree that the final appeal authority should be the head of the Agency. It seems a bit unrealistic to expect that the person responsible for the establishment and the management of the control procedures set out in Recommendation 3 could logically and impartially render a decision on an appeal from such control procedures.

ALTERNATIVE RECOMMENDATION:

- 4. The Agency must provide for an appeal procedure from any Agency decision resulting from the procedures set out in Recommendation 3 above. The final forum for appeal of such decisions shall be the governing body of the Agency.

RECOMMENDATION:

- 5. The government should establish a monitoring program, with direct participation of all of the interested parties to start before pipeline construction begins, continuing during pipeline operation and following abandonment. This monitoring group would conduct a continuing impact assessment of all regulated activities. The monitoring group would report regularly to the regulating Agency, recommending such modifications of the applicable regulations as

are shown necessary by the continuing impact assessment. Such recommendations must be followed by the regulating Agency. Only in this way can regulations inadequate to protect the social and natural environment be identified and altered.

RESPONSE:

The regulatory Agency through its surveillance of project activities conducts a continuing monitoring program to ensure performance to the Government requirements. There is no need for a monitoring group comprised of third parties. Such activity would only lead to the disruption of the project and the incurrence of very large additional costs.

ALTERNATIVE RECOMMENDATION:

5. The Agency should assure that the company maintains a monitoring program to gather specific data during construction for use following construction to assess environmental impacts of the regulated activities. In this way any regulations found to be inadequate to protect the social or natural environment can be identified and modified.

RECOMMENDATION:

6. The prime responsibility of the Agency will be the regulation of the construction activities concerned. However certain of the regulations and stipulations to be administered by the Agency will continue to have effect after construction is completed. For example there may be regulations relating to the operation of the controlled facilities. There may also be regulations requiring certain Company conduct in such things as training that extends beyond the time frame envisaged for construction. In addition the Inquiry has been told that "looping" of the first pipeline is a likely prospect. In these circumstances, it is recommended that the government set up a single Agency without a predetermined life span so that the utility of the Agency's continuing operation can be reassessed at the conclusion of the construction of the subject facilities, and in the light of whatever other mechanisms may have been developed in the interim.

RESPONSE:

Acceptable.

RECOMMENDATION:

7. The government should not appoint an independent public auditor group. The Inquiry has heard much evidence about groups of this

kind particularly as they have functioned in the Alaskan experience. It is submitted that such groups have proven to be largely ineffective in being able to monitor large construction projects on a regular basis and even more ineffective in effecting any changes in construction activities. The expenditure of funds on such an organization therefore seems unjustified, and the fiction that the public interest is being protected by the existence of such a group seems potentially harmful.

RESPONSE:

Acceptable.

RECOMMENDATION:

8. It is recommended that the costs of the Agency be assessed against the projects being regulated. This is consistent with the provisions of the "1972 Pipeline Guidelines".

RESPONSE:

Funding of the regulatory agency should be by the Federal Government. All existing regulatory bodies are Government financed and this one should be no exception.

ALTERNATIVE RECOMMENDATION:

8. It is recommended that the costs of the Agency be borne by the Government. This is consistent with past and current practice.

RECOMMENDATION:

9. It is recommended that the Agency be so structured as to provide for active third party involvement by third parties whose interests are affected by the regulated projects. These groups include environmental groups, northern native groups, and communities in the greater impact region of the proposed projects. This active participation should be effected in the following ways:
 - a) The government should invite environmental groups with a declared interest in the North to appoint a representative of their interests to sit on the senior Agency committees charged with the control functions set out in paragraph 3 above. This representative would be given the same access to information, the access to research capabilities and the same decision making power as any other member of the committee.

The government should make the same invitation to each of the territorial native groups in the N.W.T. and to the communities in the greater impact region. These representatives would of course be fully remunerated for their services and would be appointed to terms of sufficient length to ensure their effectiveness, at a minimum two years.

- b) The special status of native northerners as (at the very least, in the absence of a land claims settlement) unspecified landowners through whose property a right-of-way is being granted should be recognized in the structure and responsibility of the Agency, either by participation on a board of directors to which the head of the Agency is answerable or by some comparable scheme.
- c) The necessity of facilitating public interest intervention in the operation of the Agency must be recognized as an integral part of a responsible regulatory system. This kind of intervention is quite separate from the participation of interested parties in the functions of the Agency referred to in (a). It will be effective only if it is informed by a continuous presence sufficient to monitor the operations of the Agency. The funding of these intervenors must be separate from the funding referred to in (a), and should be shared by government and the public interest intervenors. A possible mechanism to achieve public interest intervention would give public interest groups such as those identified in (a) above the right to monitor Agency decision making and make submissions to the Agency decision makers in advance of decision.

RESPONSE:

Native people and northerners with a legitimate interest in the project should participate at the Northern Advisory Board level.

- a) The proposed Northern Advisory Board should include representation from native people and northerners. Environmental interests, along with other special interests, will be served by the Government.
- b) Arctic Gas feels that regardless of the native situation regarding land ownership, they should have input to the Northern Advisory Board.
- c) The introduction of special interest groups in a pre-eminent role to the Agency would run counter to all the advantages of a single agency. We see no role for special interest groups in the administration of the Agency's responsibilities.

ALTERNATIVE RECOMMENDATION:

9. It is recommended that the Northern Advisory Board be so structured that it will include representation of native people and northerners. This will ensure that social and environmental concerns, of the peoples and communities in the greater impact regions of the project are reflected in the function of the agency.

RECOMMENDATION:

10. Code
The government should immediately prepare a Code of performance, conduct and methodology for the pipeline, gas plants and related projects based on the recommendations continued in the text of this submission. It should detail all requirements to be imposed on the Company including those requirements under existing laws and regulations. The Code should be made legally binding on the Company and all its contractors.

RESPONSE:

The intended meaning of this recommendation is not clear. If it is a requirement that the Government should prepare a Code specifically for this pipeline, then we would point out that Codes regulating the construction and operations of pipelines in Canada have been in existence for many years. These codes which were very carefully prepared over a period of many years by code committees comprised of Government regulatory representatives and pipeline industry representatives have proven to be quite satisfactory and there is in existence within the codes provision for modification of or addition to them as circumstances indicate. In fact, such modification of these codes is an ongoing activity of the permanently established code committees. Arctic Gas believes there is no need for duplication of this effort which involves the appropriate Government regulatory bodies as well as a broad base of representation from the pipeline industry in Canada. These established codes have in many parts of Canada been adopted by Governments as being the legal requirement for the construction and operation of pipelines.

If the intended meaning is that the Government should catalog and identify all existing codes, statutes and ordinances governing the construction and operation of a pipeline and initiate action to introduce

necessary modifications to them to reflect special conditions of this project then Arctic Gas finds the recommendation acceptable.

ALTERNATIVE RECOMMENDATION:

10. The Government should immediately catalog and identify all codes, statutes and ordinances pertinent to the construction and operation of the pipeline. It should identify areas requiring modification and initiate action to achieve such modification.

RECOMMENDATION:

11. The Code should be prepared as a comprehensive documentation of regulations and practices to guide the Company but it shall in no way limit the jurisdiction or authority of the Agency to implement additional conditions as it sees fit during the course of the design review and surveillance.

RESPONSE:

The major parameters to be established by the Government for regulation of the Arctic Gas project must be fixed prior to the commencement of project activities so that Arctic Gas will have reasonable assurance that major changes to these conditions will not occur. There will be necessity for minor changes but care must be taken to establish that the major conditions are not likely to be subject to change.

ALTERNATIVE RECOMMENDATION:

11. The compilation of codes, statutes and ordinances will establish the regulations to be followed by the Company in the execution of the project. Any conditions imposed during design review or construction surveillance will conform to the established codes, statutes and ordinances.

RECOMMENDATION:

12. The Code should be supplemented by a Field Activity Atlas prepared by the Agency. The Field Activity Atlas should be a graphic, easily understood, project-specific field guide for field personnel, illustrating site-specific engineering, environmental and social constraints or considerations.

RESPONSE:

Manuals, procedures, instructions etc. will of necessity be required for use by representatives of the regulatory agency, however it seems inappropriate to deal with it specifically at this time.

ALTERNATIVE RECOMMENDATION:

12. The Agency should ensure that its representatives are provided with, and are familiar with, the appropriate codes, statutes and ordinances and that they are provided details of any pertinent site-specific factors.

RECOMMENDATION:

13. Relevant elements of the code should be applied uniformly by the government in all other government department and crown agency operations and jurisdictions in the Yukon, Mackenzie District of the N.W.T., and the Beaufort Sea for the duration of pipeline construction.

RESPONSE:

Acceptable.

RECOMMENDATION:

14. The Agency should prohibit all on site activities related to the Company's proposed works until the necessary reviews, approvals and authorizations are issued. No such documents should be issued by the Agency until it is satisfied that all stipulations have been and will be complied with by the Company.

RESPONSE:

Arctic Gas agrees in principle with this recommendation providing it means approvals of manageable segments of the work e.g. a pipeline spread, a compressor station. It should not apply to such pre-construction activities as site and line surveys, soil investigation or site preparation.

ALTERNATIVE RECOMMENDATION:

14. The agency should prohibit all on-site activities, with the exception of pre-construction requirements such as surveys, soil investigations, and site preparation, until Leave to Construct is granted.

GENERAL RECOMMENDATION

RESPONSE:

The Discussion of the General Recommendations states in the first sentence of the first paragraph that not only will stipulations of Government and the Agency be established in advance in the various form of approvals, but further that additional modified stipulations may be specified in the field by agency inspectors. Inspectors should only check and certify conformance with the stipulations set down by the Agency and should never be allowed the authority to change those stipulations or to implement new ones. Inspectors will have the opportunity to control construction activities by an established process in the event that stipulations and regulations are not being met.

RECOMMENDATION:

1. Within 20 days of receiving the necessary project approvals from government the Company shall provide the Agency with a documented organization chart of the Company as it will be structured for construction purposes and for operating purposes.

RESPONSE:

While Arctic Gas agrees with the general concept that it should present to the Agency an organization chart of the company, including the matters mentioned in detail in this recommendation as well as many other matters, it points out that 20 days is an impracticable time to expect conformance with this requirement after the necessary project approvals have been provided. There will be stipulations contained in those approvals which will have a decided impact on the organization chart of the Company and a realistic time frame must be permitted to the Company in order to accommodate properly those stipulations. The comment provided in the report on this recommendation also stipulates that the name of each individual who will fill each particular position shall also be provided, presumably within the 20 days. Arctic Gas cannot proceed to staff an organization in complete detail until it has project approval. It would be impossible to select all the individuals concerned within the time frame suggested.

ALTERNATIVE RECOMMENDATION:

1. As soon as is practicable after receiving the necessary project approvals from Government, the Company shall provide the Agency with an organization chart of the Company as it will be structured for construction purposes and for operating purposes.

RECOMMENDATION;

2. Within 20 days of receiving the right-of-way permit and or the Certificate of Convenience and Necessity from government Agency the Company shall submit to the government a fully documented organization chart for a typical construction spread during all of its various stages of work.

RESPONSE:

This requirement can be accomplished, but not in the 20 days time frame after certification as set out in this recommendation.

ALTERNATIVE RECOMMENDATION

2. As soon as is practicable after receiving the right-of-way permit and/or the Certificate of Convenience and Necessity from Government, the Company shall submit to Government an organization chart for a typical Construction spread during all of its various stages of work.

RECOMMENDATION

3. Each application submitted to the Agency by the Company shall include activity schedule and personnel organization chart (see also "project Regulation: The Government").

RESPONSE:

The intent of this recommendation is not clear. The matter of advising the Agency as to site work and personnel schedules will have to be developed between the Agency and the Company and be practical and workable. It is recognized that the Agency must be aware of the Company's schedules and organization for each site and work segment.

ALTERNATIVE RECOMMENDATION

3. The Agency and the Company shall develop the necessary method for the Company to advise the Agency of work schedules and staff organization for each site and work segment.

RECOMMENDATION:

4. The Company shall provide the Agency with complete updates of its organization charts and the related documentation (see 1 and 2 above) within 2 weeks of any changes and/or additions.

RESPONSE:

While Arctic Gas would agree with the requirement that at appropriate intervals new organization charts and related documentation should be presented, it is impracticable to require a new submission for every change or addition that occurs. Since the suggested requirement in Recommendations 1 and 2 stipulates that the names of individuals shall be provided for each position, it follows that upon the departure of any individual a new organization chart and related documentation, must be presented to the Agency. Arctic Gas would suggest instead that any changes should be reflected in a report to be made perhaps once each month.

ALTERNATIVE RECOMMENDATION

4. The company shall provide the agency with complete updates of its organization charts on a monthly basis.

RECOMMENDATION:

5. The Company shall, in all its contracts and subcontracts relating to supply, construction, operation, maintenance, surveillance, monitoring or other activity associated with the pipeline project legally bind all organizations or individuals directly or indirectly in its employ to the conditions imposed on the Company by the Government and the Agency.

RESPONSE:

This would present considerable difficulty in implementation. The Agency must look to the Company for compliance with conditions. The Company will pass on responsibility to the contractors and suppliers as is practical.

ALTERNATIVE RECOMMENDATION:

5. The company will be responsible for compliance by its contractors and suppliers with the conditions imposed on the Company by the Government and the Agency.

RECOMMENDATION:

6. Since all permits and approvals will be issued to the Company it shall be responsible for all work and activities of its contractors and subcontractors and shall inspect all works done to assure that the work is done in the prescribed manner according to the stipulations of the Agency.

RESPONSE: Acceptable.

RECOMMENDATION:

7. The Company shall provide for Agency approval prior to final design, a comprehensive Design Manual to be used by the Company in arriving at its final mile by mile design. Such a manual shall be a designer's guide to all aspects of layout, construction and operation of the pipeline and its related works.

RESPONSE: Acceptable.

RECOMMENDATION:

8. The company shall provide, for Agency approval, after commencement of final design but prior to field construction activity on any part of the project, a complete Design Change Manual which will be used in the field by the Company personnel and inspectors charged with the responsibility of seeing that designs are properly implemented.

Comment: The Design Manual and Design Change Manual which both Applicants before the Inquiry have suggested are in preparation or will be prepared to guide their own design staff will, when approved by the Agency, become a basic reference document for those charged with design approvals. Therefore, both manuals must be made available to the Agency for thorough evaluation well in advance of final design submissions.

RESPONSE: Acceptable.

RECOMMENDATION:

9. All design changes made subsequent to design approval shall be reported to the Agency within one week of the change being made. All changes to approved drawings or practices shall be supported by citing the field condition and by reference to relevant sections of the Design Manual or Design Change Manual or relevant instructions by the Agency field inspection representatives.

RESPONSE:

This recommendation is acceptable in principle to Arctic Gas but the time frames and methods of reporting should be left to be developed by the Agency and the Company.

ALTERNATIVE RECOMMENDATION:

9. All design changes subsequent to design approval and all changes to approved drawings or practices shall be reported to the Agency. The time frame and method of reporting shall be determined by the Agency and the Company.

RECOMMENDATION:

10. The Company shall designate in its own organization a distinct and separate group at both the field and head office levels, to be responsible for quality control of all phases of construction by ensuring that the approved designs, procedures and terms and conditions are implemented in the manner intended.

RESPONSE: Acceptable.

RECOMMENDATION:

11. The Company shall have its own full time Quality Control Inspectors in the field.

RESPONSE:

Arctic Gas accepts this recommendation but does not accept the suggestion and the comment following it that perhaps the Agency can assign the Company's Quality Control Inspectors. Only the company should have the authority to do that. Arctic Gas agrees with the individual segments of this Recommendation (a) through (g), but takes the position regarding (h) that the Agency and the Company should jointly determine other sites or areas where the assignment of Quality Control Inspectors is necessary.

ALTERNATIVE RECOMMENDATION:

11. That recommendation item (h) be altered to read

"at any other site that the Agency and the Company jointly determine that assignment of Quality Control Inspectors is necessary."

RECOMMENDATION:

12. The Company's Quality Control Inspector shall keep a daily diary, log and photo journal, in a form acceptable to the Agency, noting the site work done, engineering, construction and environmental problems encountered, design changes implemented, instructions issued by the Agency field representative, etc.

RESPONSE:

Arctic Gas agrees that a Quality Control report procedure by the Company to the Agency should be established. The details of such a report should be developed by the Agency and the Company.

ALTERNATIVE RECOMMENDATION:

12. The Company shall keep detailed Quality Control records as required by the Agency in a format to be developed by the Agency and the Company.

RECOMMENDATION:

13. The Company's Quality Control Inspector shall prepare a weekly summary report of the site work progress and problems noting all field engineering/environmental aspects of the work. The summary shall certify that, except as specifically noted, all work was conducted and installed according to the Agency approved plans and procedures.

RESPONSE:

There is an incorrect position stated in this Recommendation. That is that the field engineering aspects of the work shall be reported by the Quality Control Inspector. This is not the function of Quality Control and should not be included in their responsibility. It detracts from the primary responsibility of Quality Control which is to ensure conformance with quality requirements. Field engineering is a separate and distinct engineering activity that should be kept separate from Quality Control activity.

ALTERNATIVE RECOMMENDATION:

13. The company shall prepare a weekly summary report of Quality Control activities. The report to be in a format developed by the Agency and the Company.

RECOMMENDATION:

14. The Company's Quality Control Group shall be responsible for the preparation of "as-built" plans of all aspects of the permanent installations and those temporary installations designated by the Agency (e.g. fuel tanks, wharf sites, water intakes etc.) As-built plans shall be prepared as construction proceeds.

RESPONSE:

Arctic Gas does not accept this recommendation. The preparation of "as-built" plans is not a function of Quality Control. This activity would interfere and detract from the primary function of Quality Control which is assurance of conformance with quality requirements. The preparation of "as-built" plans is a responsibility of the field engineering group.

ALTERNATIVE RECOMMENDATION:

14. The Company will prepare "as-built" drawings for all permanent installations and such temporary installations as designated by the Agency. "As-built" drawings shall be prepared as construction proceeds.

RECOMMENDATION:

15. The Company shall, on demand, provide the Agency with an up to date status report on the stage, quality and as-built status of any aspect of the project within 15 days of any such request.

RESPONSE:

Arctic Gas' position is that if such reports are to be required by the Agency, it should be on an established periodic basis rather than on demand. Where special circumstances dictate, special reports can be prepared in a timely manner.

ALTERNATIVE RECOMMENDATION:

15. The Company shall, on a periodic basis developed by the Agency and the Company, provide the Agency with an up-to-date status report on the stage, quality and as-built status of the project. Where circumstances dictate, special reports shall be prepared in a timely manner.

RECOMMENDATION;

16. The Company shall develop comprehensive contingency plans for various aspects of the project as outlined and as otherwise identified by the Agency.

RESPONSE:

This recommendation is acceptable, in principle, to Arctic Gas. The extent to which details have to be reported is a product of the severity of impact or the consequences of the event occurring, and have to be developed by the Agency and the Company.

RECOMMENDATION:

17. At each activity associated with construction or operation of the pipeline the Company shall have a designated representative on site at all times during the work. Where a designated Company representative must leave the site or otherwise be unavailable, he shall notify

the Agency's field representative in writing of the interim designated representative and this person shall assume all duties, responsibilities and powers of the designated representative.

RESPONSE:

Insofar as the construction period is concerned, Arctic Gas agrees in principal with this Recommendation. The determination of the specifics of "on site" should be left to determination by the Agency and the Company. During the operation of the pipeline it would be impractical to have a Company representative at each site throughout the system. Again the determination of the needed location for designated representatives of the company should be left to determination by the Agency and the Company. The question of responsibility during absence as well as any other procedural details should be left for determination by the Agency and the Company.

ALTERNATIVE RECOMMENDATION:

17. At all construction sites designated by Agency the Company shall maintain a designated representative. Responsibility during authorized absences, and other procedural details shall be defined by the Agency and the Company.

RECOMMENDATION:

18. The Company's designated representative on site shall immediately cease any work associated with the site or part thereof if requested to do so by the Agency's field representative.

RESPONSE:

The authority provided to any representative of the Agency to order a cessation of work must be clearly and precisely established by the Agency in conjunction with the Company. The Company's designated representatives will abide by such procedures so established.

ALTERNATIVE RECOMMENDATION:

18. The authority of the Agency's field representative to request a cessation of any work shall be clearly and precisely established by the agency and the Company. The Company's designated representative on site shall comply with any such request made within the established authority of the Agency representative.

RECOMMENDATION:

19. The Agency field representative's instructions shall be final until they are superceded by written instructions to the contrary either by the field representative or his superiors.

RESPONSE:

The procedures regarding the authority of the Agency's representatives and the implementation of such authority including the necessary action and response by the Company or its representatives should be worked out in an established procedure by the Agency and the Company.

ALTERNATIVE RECOMMENDATION:

19. The Agency's field representative's authority to influence construction activity shall be based on an established procedure developed by the Agency and the Company.

RECOMMENDATION:

20. The Company shall provide immediate, complete and free access to all parts of the project for all Agency representatives unless such access is a safety hazard in which case the Company shall so advise in written form which clearly describes the nature of the hazard.

RESPONSE:

Arctic Gas agrees with this Recommendation except there may be cases in which a written notice would be impracticable.

ALTERNATIVE RECOMMENDATION:

20. The Company shall provide immediate, complete and free access to the facilities under construction to all Agency representatives unless such access is a safety hazard - in which case, to the extent practical, the Company shall so advise in writing describing clearly the nature of the hazard.

RECOMMENDATION:

21. Upon discovery of a situation that is, or could become, harmful in any way to the natural or social environment, the Company shall:
 - (a) immediately notify the Agency;
 - (b) take the appropriate remedial action; and
 - (c) alter or stop the particular activity until a mitigative response can be implemented. Comment: The problem of notification of responsibility for "upset" or non-compliance

situations is one that will have to be carefully addressed by the Company and the Agency because of the dilution of accountability inherent in a large subcontracted project. (see also "Enforcement").

RESPONSE:

Arctic Gas agrees in principal with this Recommendation but as noted in the Comment thereto, the definition of those events which must be reported and the manner in which they must be reported should be worked out between the Agency and the Company.

RESPONSE:

No alternative wording to the Recommendation is suggested.

RECOMMENDATION:

22. The Company shall, upon notification or discovery of an environmentally hazardous situation, immediately assume all responsibility and costs to mitigate the situation and shall continue to do so until officially notified otherwise by the Agency.

RESPONSE:

Arctic Gas will assume responsibility and costs to mitigate environmentally hazardous situations created by the pipeline project activities.

ALTERNATIVE RECOMMENDATION:

22. The Company shall, upon notification or discovery of an environmentally hazardous situation, occurring as a result of pipeline project activities, immediately assume all responsibility and costs to mitigate the situation and shall continue to do so until notified otherwise by the Agency.

RECOMMENDATION:

23. The Company shall deploy all the equipment and personnel to mitigate a hazardous or emergency situation to the fullest extent of its ability and shall, if necessary, alter work on, or related to, the pipeline to do so. In responding to such situations, the Company shall keep an itemized account of all costs of men and equipment used.

RESPONSE:

In a hazardous or emergency situation occurring as a result of project activities, Arctic Gas will assume the responsibility to mitigate the situation. In a hazardous or emergency situation not related to pipeline project activities, Arctic Gas would assist in mitigation to the fullest

extent possible without endangering critical activities in the pipeline project plan.

ALTERNATIVE RECOMMENDATION:

23. The Company shall assume full responsibility to mitigate any hazardous or emergency situation resulting from or related to pipeline activities. The Company shall assist in mitigating any other hazardous or emergency situation to the fullest extent possible under the pipeline project plan.

RECOMMENDATION:

24. Where the cause of an environmental emergency situation is found by the government to be unassociated in any way with activities relating to the pipeline, the government shall pay for all direct expenses at cost but shall not assume any responsibilities, financial or otherwise, for the Company's loss of production.

RESPONSE:

Arctic Gas expects to respond to any true emergency situation. Some concern exists about what is defined as an emergency. The cost reimbursement suggested is not sufficiently comprehensive.

ALTERNATIVE RECOMMENDATION:

24. Where the cause of an environmental emergency situation is found by the government to be unassociated with activities relating to the pipeline, the government shall pay the Company for its costs incurred in mitigating the situation.

RECOMMENDATION;

25. One member of the Board of Directors of the Company shall, in rotation, visit each operating spread at least once a month. Prior to the visit, the Director shall be briefed by the Agency.

RECOMMENDATION:

26. Upon written instruction by the government's field representative or upon notification by the Agency of an environmental situation of major concern, a member or members of the Board of Directors or senior management shall be made available to be on site for continuous periods as determined by the Agency.

RECOMMENDATION:

27. Ten days after a visit to the project the Director(s) or senior management people shall submit a project status and compliance report to the Agency.

RESPONSE:

Arctic Gas does not accept these Recommendations. The organization chart and function responsibility chart submitted by the Company to the Agency will spell out the responsibilities of each level of authority in the Company.

Recommendations 25, 26 and 27 should be omitted.

PROJECT REGULATION - ENFORCEMENT

RECOMMENDATION:

1. The government should assert in the right-of-way permit that the onus of proof of acceptability for all activities and matters undertaken by the Company either directly or indirectly shall rest entirely with the Company.

RESPONSE:

The intent of this Recommendation is not clear. Arctic Gas interprets it to be a restatement of what must be done to obtain approvals - if this is so, it is acceptable. If it goes beyond that, Arctic Gas does not accept it.

ALTERNATIVE RECOMMENDATION:

1. The government should assert in the right-of-way permit that the onus of proof that all activities and matters undertaken by the Company are in accordance with the final design and plans, rests with the Company.

RECOMMENDATION:

2. If the Company wishes to act in a way that does not conform to the stipulations, codes, terms or conditions, established by the government, the Agency should require that the Company demonstrate to the complete satisfaction of the Agency the merit of proposed actions and that such actions will not be any more harmful to the natural or social environments in the short or long term.

RESPONSE:

This Recommendation is acceptable to Arctic Gas.

RECOMMENDATION:

3. In assessing the cause of any adverse effect on, or adjacent to, the project, the government should specify that it shall be sufficient proof to establish that it was committed by an employee, agent, contractor or subcontractor (or employees thereof) of the Company, whether identified or not. The Company should be held liable for all penalties and actions as described herein.

RESPONSE:

This clause needs considerable clarification. If it means to indicate that the Company will be responsible for any breach of the terms of the right-of-way agreement by its employees, agents, contractors or subcontractors (or employees thereof) then Arctic Gas has no difficulty with this concept. The qualification that it is not necessary to identify the organization or person who commits a breach of the terms of the right-of-way agreement is not reasonable unless its application is to areas of the project to which only such organizations and persons have access.

ALTERNATIVE RECOMMENDATION:

3. In assessing the cause of any adverse effect on, or adjacent to, the project the government should specify that it shall be sufficient proof to establish that it was committed by an employee, agent, contractor or subcontractor (or employees thereof) of the Company, whether identified or not, assuming the adverse effect occurred in an area on or adjacent to the project to which only such organizations and persons have access.

RECOMMENDATION:

4. The government should, in accordance with the "1972 Pipeline Guidelines" (p.4), require that the Company deposit a performance bond.

RESPONSE:

This Recommendation is unacceptable. A performance bond should not be necessary since a project of this magnitude is sufficient base for guarantee of the Company's performance.

RESPONSE: Recommendation 4. OMIT

RECOMMENDATION:

5. The government should require that, upon request, the Company's contractors post a Field Activity Bond with the Agency.

RESPONSE:

Arctic Gas has given its views on the responsibility which it is prepared to assume for its employees, agents, contractors or subcontractors in its response to Recommendation 3 above. Arctic Gas feels that the penalty provisions of the proposed right-of-way agreement with the Government should be sufficient protection for the Government in the unlikely event of a breach of stipulations by the Company or its contractors, etc. To require a form of performance bonding from contractors would be unnecessary.

RESPONSE: Suggest Recommendation 5 be omitted.

RECOMMENDATION:

6. If the Company or any of its contractors fails in any way to comply with the terms and conditions or the instructions of the Agency's field representative, the Agency should immediately arrange to have others carry out the necessary work to ensure compliance and should charge all costs so incurred plus a five percent administration fee to the Company.

RESPONSE:

Arctic Gas recognizes that the Agency can arrange for unfinished work to be completed at Company expense, by a third party. Any assumed default of this nature must be based on the terms and conditions of the right-of-way permit.

ALTERNATIVE RECOMMENDATION:

6. If the Company or any of its contractors fails in any way to comply with the terms and conditions of the government, the Agency may arrange to have others carry out the necessary work to ensure compliance and should charge all costs so incurred to the Company.

RECOMMENDATION:

7. The government should prescribe that the Company be responsible for inspecting the work of all its contractors and subcontractors to assure that it is done within the prescribed terms and conditions, codes, Acts, Regulations and field instructions. Where noncompliance situations exist the Company shall be responsible for implementing all necessary mitigative measures and shall be required to implement all penalties called for in its contracts with the offender.

RESPONSE:

This Recommendation is acceptable to Arctic Gas.

RECOMMENDATION:

8. The authority to enforce all stipulations should be vested in the Agency's field representative, who should have the power to stop any activity which does not or will not comply with the terms and conditions. No work should recommence after a shut down until the Company has demonstrated conclusively that the problems associated with the shut down have been overcome.

RESPONSE:

The authority of the Agency's representatives to enforce stipulations including the power to order a cessation of any activity presumably will be established in some considerable detail by the Agency. The development of this should be done with the advice and the assistance of the Company.

ALTERNATIVE RECOMMENDATION:

8. The authority to enforce all stipulations should be vested in the Agency's field representative, who should have the power to stop any activity which is in significant non-conformance with the terms and conditions. No work should recommence after a shut down until the Company has resolved the problems associated with the shut down. The precise definition of authority and the procedure for exercising it shall be developed by the Agency and the Company.

RECOMMENDATION:

9. The Agency's field representative should be empowered to enforce compliance in situations where the Company or its contractors are failing to perform in an environmentally or socially responsible way by:
 - (a) requiring the Company to change its method of environmental and social inspection at the site; and
 - (b) requiring that a senior management employee of the Company or its contractor be on site and remain on site to assume all responsibility for operations until environmentally responsible behaviour is demonstrated to the satisfaction of the Agency.

RESPONSE:

The response given to Recommendation 8 applies to this Recommendation. The matter should be developed in greater detail than is provided here. The measures set out appear to be inadequate.

ALTERNATIVE RECOMMENDATION:

9. The Agency and the Company shall develop the methods and procedures by which the Agency's field representative can exercise the necessary authority to enforce compliance where the Company or its contractors are failing to perform in an environmentally or socially responsible way.

RECOMMENDATION:

10. The government should develop a hierarchy of measures of escalating severity that can be applied to individuals, groups, subcontractors, contractors and the Company both in the field, in the corporate offices and in the courts for non-compliance situations that might arise due to:
 - (a) accidents,
 - (b) negligence or carelessness,
 - (c) wilfull non-compliance.

RESPONSE:

We have experienced considerable difficulty in understanding the intent of this Recommendation. On the assumption that this is intended to recommend a heirarchy of penalties to be incorporated in the right-of-way agreement it appears completely contrary to the concept of enforcement of terms set out in Recommendations 3 and 5. If it is intended to be a recommendation for the development of new legislation, then Arctic Gas has no position. In any event, the phrase "both in the field, in the corporate offices and in the courts" is incomprehensible.

With respect to the observations in the "Comment", Arctic Gas has the following comments:

- (i) The idea that the prospective non-compliance of a term and conditions should bring the immediate forfeiture of non-negotiable penalties is not acceptable.
- (ii) We agree that works should not be undertaken in an environmentally hazardous manner.
- (iii) There seems to be little possibility of an individual or an organization obtaining "environmental insurance". This will

not be necessary in any event since, as indicated above, the matter of default will be between the Government and the Company pursuant to the terms of the right-of-way agreement.

(iv) Similarly, the suggested requirement for an Environmental-Social Design Deposit with the Agency is unnecessary and would make the hiring of workers nearly impossible.

(v) In summary, this term and condition read in conjunction with the "Comment" is unworkable, unnecessary and unrealistic.

RESPONSE: Recommendation 10. OMIT

RECOMMENDATION:

11. The government should undertake to re-evaluate the adequacy for this project of all the penalties under legislation that will be administered by the Agency.

RESPONSE:

This is a recommendation to the Government and it is inappropriate for Arctic Gas to comment.

RECOMMENDATION:

12. All the Agency's field representatives should be thoroughly trained in the methods of gathering evidence and expediting prosecutions for violations of stipulations relating to the pipeline project.

RESPONSE:

This is a recommendation to the Agency and it is inappropriate for Arctic Gas to comment.

RECOMMENDATION:

13. Concurrent with the granting of the right-of-way permit, the government should appoint a special crown prosecutor whose prime responsibility shall be to handle cases relating to the pipeline project.

RESPONSE:

This is a recommendation to the government and it is inappropriate for Arctic Gas to comment.

Project Regulation
Environmental and Social Training

RECOMMENDATION

1. The Company shall hire an independent educational organization to develop and conduct an environmental and social education program for all persons (project and government employees) associated with the pipeline and related projects (in design offices as well as field positions) during both construction and operation of the pipeline.

RESPONSE

The responsibility for development and implementation of an educational program (including environmental, social, survival, safety, etc. issues) will be that of the Company. The method of instituting it may be one of or a combination of the following: existing institutes (public or industry), staff, consultant.

ALTERNATIVE RECOMMENDATION

1. The Company shall develop and institute effective training programs for all personnel, staff and contractor, to familiarize them with the following issues: environmental, social, safety, survival, skill development, native orientation.

RECOMMENDATIONS

2. Such a program shall commence operation at least one full year before the start of pipeline construction.
3. The environmental-social education programs shall incorporate the specific recommendations of the Environmental Protection Board as set forth in "Environmental Training of Pipeline Construction Workers", and shall include material developed to cover social factors of particular concern to the region and its people.

Project Regulation
Environmental and Social Training

4. All tender documents for sub-contractors shall include the requirement that all staff receive the appropriate environmental and social training.
5. While short, introductory lectures for workers will be essential, it is recommended that the emphasis of the programs be on a continuous series of lectures, audio-visual presentations and discussion groups held with the workers in the camps and on-the-job.
6. The orientation of the contents of the training programs is to be practical, stressing the kinds of social and environmental problems the individual pipeline worker would encounter while working in the North.

RESPONSE

Recommendations 2, 3, 4, 5 and 6 are acceptable to Arctic Gas.

RECOMMENDATION

7. The ultimate authority for all matters relating to the environmental and social education program shall be the Agency. It is expected that the Agency would set up monitoring procedures for the program that would involve special interest groups. In order to prevent biases and the wrong kinds of impressions from infusing such material, it is particularly important that the native people should play a significant role in developing any material that refers to them.

RESPONSE

We believe that the program content should be the responsibility of Arctic Gas, but developed in consultation with the Government and interested parties.

Project Regulation
Environmental and Social Training

ALTERNATIVE RECOMMENDATION

7. All matters relating to the environmental and social education program shall be agreed upon by the Company and the Government.

PROJECT OPERATION

Recommendations included in this report of the project are intended to be generally applicable with the exception of those for which specific data are provided.

PROJECT OPERATION

- Introduction
- Line Patrol and Inspection
- Routine Maintenance
- Transportation Requirements
- Deactivation
- Regulation

PROJECT OPERATION

Recommendations included in this section of Chapter 3 are considered by Arctic Gas to be generally acceptable with the exception of those for which comments are provided.

PROJECT OPERATION - INTRODUCTION

RECOMMENDATION - General

Every effort shall be made to perform all maintenance and repair work during the winter.

RESPONSE

The operation and maintenance of a gas pipeline system is a year-round task; and most of the tasks involved are compressor station oriented.

ALTERNATIVE RECOMMENDATION

Every effort shall be made to perform right-of-way maintenance and repair work during the winter.

PROJECT OPERATION - LINE PATROL AND INSPECTION

RECOMMENDATION

1. The Company shall carry out regular visual inspections of the pipeline right-of-way, using small fixed-wing aircraft. The frequency of such flights shall not exceed one per week. The aircraft shall be operated in accordance with conditions described in the section on "Transportation Requirements for Operation and Maintenance". Helicopters shall not be used for line patrol in critical wildlife areas.

RESPONSE

It may well be necessary during certain periods of some years to carry out patrol flights more frequently than once per week in order to make certain that the pipeline, right-of-way, and areas adjacent to the right-of-way are not in danger of damage or failure. In some instances it may be necessary to utilize helicopters for these flights so that quick access to the ground is possible. In all instances, however, environmental constraints as outlined in relevant environmental and flight procedures manuals will be noted and conformed with. The recommendation should be reworded as follows:

ALTERNATIVE RECOMMENDATION

1. "The Company shall carry out regular visual inspection of the

Project Operation
Line Patrol and Inspection

pipeline right-of-way using fixed-wing aircraft, helicopters, or surface vehicles as required. Whenever possible, overflights of the right-of-way should be limited to one per week. All right-of-way inspections shall be carried out within the constraints as outlined in relevant environmental and flight procedures manuals.

PROJECT OPERATION - ROUTINE MAINTENANCE

RECOMMENDATION

5. On August 31 of each operating year the Company shall submit reports to the appropriate government departments and agencies describing all maintenance work performed during the preceding year and giving a detailed outline of maintenance plans for the following year.

EMERGENCY REPAIRS

RECOMMENDATION

10. Each emergency incident or accident shall be reported in accordance with Sections 85 and 86 of the Gas Pipeline Regulations (NEB 1974). In addition of 31 August of each operating year, the Company shall submit summary reports to appropriate government departments and agencies, describing all emergency repair activities undertaken during the preceding year, and indicating what steps have been taken to try and prevent similar emergencies from arising in the future.

RESPONSE

We see no reason for "imposing standards and regulations on any Mackenzie Valley Pipeline that go beyond present practice". (Project

Project Operation
Routine Maintenance

Operation, Introduction, Page 2) where current codes and regulations (CSA Z-184 and the National Energy Board "Gas Pipeline Regulations") cover the situation in question.

In this case, the imposition of a requirement to report "all maintenance work" and a requirement to duplicate reporting procedures on August 31 (or any other date) each year appears an unnecessary requirement.

A recommendation that codes and regulations currently in use be revised and/or expanded where necessary to include arctic pipeline requirements is acceptable.

ALTERNATIVE RECOMMENDATIONS

5. The Company shall submit reports as required to the appropriate government departments.
10. Each emergency incident or accident shall be reported in accordance with the latest revision to the NEB "Gas Pipeline Regulations".

PROJECT OPERATION - TRANSPORTATION REQUIREMENTS

RECOMMENDATION

2. All aircraft operations shall be in accordance with plans worked out in conjunction with and supervised by the relevant Territorial wildlife agency and the Canadian Wildlife Services, and designed to meet the concerns outlined in the sections of this report on "Wildlife Protection". Such plans shall specify types of aircraft, frequency of flights, minimum flying height, flight corridors and areas of avoidance and provisions relating to landings by helicopters. In addition, aircraft should be operated under the following constraints:

a) through n) (Fourteen constraints are listed)

RESPONSE

As described in the responses to similar constraints suggested in recommendations in Chapter II, Wildlife Protection, the detailed constraints are considered by Arctic Gas to be too restrictive and this opinion is substantiated by Arctic Gas research. The recommendation should be reworded as follows:

ALTERNATIVE RECOMMENDATION

2. "The Company shall ensure that all project-related aircraft

Project Operation
Transportation Requirements

flights abide by minimum heights and overflights restrictions
issued by the Agency."

PROJECT OPERATION - TRANSPORTATION REQUIREMENTS

RECOMMENDATION

10. Small boats with motors should not be used by the Company in Shallow Bay during the white whale calving period, from approximately July 1 to July 31 of any year.

RESPONSE

The recommendation should regulate against harassment of white whales and other forms of wildlife rather than just forbid the use of small boats. The recommendation should be reworded as follows.

ALTERNATIVE RECOMMENDATION

10. Transportation equipment shall not be allowed to unduly interfere with or harass any form of wildlife.

PROJECT OPERATION - TRANSPORTATION REQUIREMENTS

RECOMMENDATION

13. Air cushion vehicles shall not be operated along the Yukon North Slope or in the Mackenzie Delta in the summer time.

RESPONSE

A rewording of the first sentence in Recommendation 13 to read "Operation of air cushion and other vehicles shall be in accordance with plans developed in conjunction with appropriate regulatory agencies"; and deletion of Recommendation 14 is a practical and logical alternative to what has been recommended. The point is that while air cushion (or any other vehicle) may not be acceptable today it may well be at some future date.

Arctic Gas has taken the position (contrary to the implication on page 10) that air cushion vehicles are candidates for use in the Arctic. The "Operational capabilities and limitations of the currently available machines" (Page 10, paragraph 1) are well known to Arctic Gas. The potential of these and other machines should, however, be recognized.

ALTERNATIVE RECOMMENDATION

Operation of air cushion and other vehicles shall be in accordance with plans developed in conjunction with appropriate regulatory agencies.

Project Operation
Transportation Requirements

Note: - Recommendation 14 should be deleted.

PROJECT OPERATION - DEACTIVATION, CLOSURE, ABANDONMENT

RECOMMENDATION

6. The Company shall present a preliminary plan and environmental impact statement covering the matters of deactivation, closure, and abandonment of the pipeline system as part of the final design.
9. The Company shall present preliminary plans and environmental impact statements covering closure and deactivation of all or part of the pipeline system for various time periods as part of the final design.

RESPONSE

The submission of detailed plans for abandonment of facilities years before the abandonment will take place is impractical. It is not possible to predict what conditions will exist (or what facilities will exist) 20-50 years after operations commence.

The National Energy Board's "Gas Pipeline Regulations" deals with abandonment of gas pipelines and would be followed if abandonment were planned for the immediate future. These regulations and others are, however, revised from time to time and the Company will, of course, comply with all regulations that exist at the time the decision to abandon is made.

Project Operation
Deactivation, Closure, Abandonment

ALTERNATIVE RECOMMENDATIONS

6. The Company shall present plans and an environmental impact statement covering deactivation, closure, and abandonment of the pipeline system to the appropriate authorities at the time the decision to abandon is made.
9. The Company shall present plans and an environmental impact statement covering closure and deactivation of all or part of the pipeline system for various time periods at the appropriate time and to the appropriate Authority.

PROJECT OPERATION - REGULATION

RECOMMENDATION

1. The Company shall present comprehensive preliminary plans for all aspects of operations, maintenance and abandonment of the pipeline and all associated facilities at the time of final design. Preliminary drafts of all operations and maintenance manuals shall be produced at this time also. The plans and manuals shall be submitted to the Agency for approval.

RESPONSE

The requirement for all operational detailed plans and procedures to be submitted for approval at the time of final design is impractical. The Operations and Maintenance Panel have made commitments to the Mackenzie Valley Pipeline Inquiry and to the National Energy Board to provide these to the proper authorities prior to the facilities being put into operation.

ALTERNATIVE RECOMMENDATION

1. The Company shall prepare comprehensive plans for operation and maintenance of the pipeline and all associated facilities prior to the system being put into operation. Operation and Maintenance manuals shall also be prepared by this time. The plans and manuals shall be submitted to the Agency for approval.

